

EXHIBIT F



OCEAN TOMO

INTELLECTUAL CAPITAL EQUITY

ORACLE AMERICA, INC.

v.

GOOGLE INC.

CASE NO. CV 10-03561 WHA

RESPONSIVE EXPERT REPORT OF JAMES E. MALACKOWSKI

[CORRECTED]

February 29, 2016



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1. FIRM BACKGROUND AND QUALIFICATIONS

1. My background and qualifications are set forth in my prior report dated January 8, 2016.

2. ASSIGNMENT

2. Ocean Tomo was retained by Orrick, Herrington & Sutcliffe LLP (“Orrick”) counsel for plaintiff, Oracle America, Inc. (“Oracle” or “Plaintiff”), in connection with this matter in July of 2015. Ocean Tomo has been asked to evaluate the amount of monetary recovery due to Oracle for Google Inc.’s (“Google” or “Defendant”) infringement of copyrights in the Java platform (“Infringed Java Copyrights”) in connection with Google’s Android platform for use in mobile phones and other devices.
3. In connection with my assignment in this matter, I issued an expert report on January 8, 2016 which provided my opinions regarding the amount and type of losses suffered by Oracle, as well as the non-apportioned revenues and profits generated by Google that, in my opinion, meet the causal nexus test (“Initial Report”).
4. As explicitly stated in my Initial Report, as of the date of that report, I had not addressed the issue of apportioning Google’s profits which meet the causal nexus test between infringing and non-infringing attributes of the Android Platform, referred to generally as Google’s causally connected profits. Rather, I expected to offer such opinions in a later report, as set out by the three-part damages report schedule in this case.
5. This is that “later report” and therefore it reflects my opinions regarding the apportionment of Google’s causally connected profits. In addition to addressing the apportionment of Google’s causally connected profits, this report also provides responses to several opinions put forth in the report submitted by Google’s damages expert (Dr. Gregory Leonard) on February 8, 2016 (“Leonard Report”).
6. A detailed listing of the documents reviewed by Ocean Tomo since the issuance of my Initial Report is included in the footnotes to this report and/or the summary provided in Exhibit 2. References to documents and testimony herein are meant to provide examples of supporting information, but are not intended to be a comprehensive or exhaustive listing of all known support or to signify a heightened level of importance. In addition to this report, I may rely on video excerpts taken from videotaped depositions and/or demonstrative exhibits that illustrate the concepts and conclusions contained in this report. Such excerpts and/or demonstratives have not yet been prepared.
7. The opinions discussed throughout this report are based on my current understanding of the facts and circumstances surrounding this matter, my review of the produced documentation, testimony, third party and public information available to date, the legal framework for copyright remedies, and any underlying assumptions upon which I have relied. As such, the analyses and opinions described herein are subject to change based upon additional discovery or any other relevant development.



8. In connection with my work in this matter, I have assumed the Infringed Java Copyrights are copyrightable and have been infringed. That assumption is made exclusively for the purpose of determining the appropriate measure and amounts of monetary recovery, and in no way represents any form of legal conclusion.

3. SUMMARY OF OPINIONS

9. As stated in my Initial Report, I understand Oracle is entitled to the amount of actual damages it has suffered as a result of Google's infringement, as well as any profits earned by Google which are attributable to its infringement, but not already taken into account in computing Oracle's actual damages.¹
10. As also stated in my Initial Report, at a minimum, Google's infringement of the Java Copyrights resulted in Oracle losing licensing revenues from third-party license agreements and also prevented Oracle (or its licensee) from launching a new mobile platform. In my Initial Report, I determined that Oracle's lost profits from lost Java ME license agreements with third parties totaled \$475 million. I also concluded that, while I was unable to quantify with reasonable certainty Oracle's lost profits resulting from it having been prevented from launching a new mobile operating system, nor any other component of potential loss, I was confident that such losses had in fact occurred. While the Leonard Report rebuts my opinions related to Oracle's losses, as discussed later in Section 5, my opinions in that regard remain unchanged.
11. My Initial Report also quantifies the amount of total profit Google realized as a result of the infringement of the Java Copyrights by the Android platform. In that report I noted Google has generated Android-related revenue and profit which is attributable to the Infringed Java Copyrights, including: advertising revenues associated with Android devices; sales of Applications and Digital Content through Android Market/Google Play; and sales of Google's Nexus devices. Although Oracle was only required to present proof of the infringer's gross revenues at the time of my Initial Report, I nonetheless included in my analysis all of the costs and expenses which I believe should be deducted from those gross revenues. While the Leonard Report responds to my opinions regarding the causal nexus between certain of Google's revenues and the Infringed Java Copyrights, and the amount and type of costs I have subtracted from those revenues, with the few revisions reflected herein, my opinions in that regard remain unchanged, as discussed later in Section 4 of this report.
12. Since it is Defendant's burden to establish an apportionment of profits between infringing and noninfringing attributes, my Initial Report did not offer any opinions regarding the portion of Google's profits which related to infringing attributes of the Android Platform. Rather, I deferred the proffer of any such opinions to the issuance of this report.
13. In connection with preparing my opinions on the issue of apportionment, I have considered the opinions put forth in the Leonard Report. I conclude that Dr. Leonard's "bottom-up"

¹ 17 U.S.C. §504 – Remedies for Infringement: Damages and Profits.



apportionment approach is fundamentally flawed in that it reflects an attempt to quantify Google's "unjust enrichment," as opposed to more properly measuring the portion of the profits actually generated by Google which can reasonably be attributed to the infringing attributes of the Android platform versus the noninfringing attributes.

14. I further find Dr. Leonard's reliance on a "counterfactual" world to evaluate disgorgement undermines any reliability of his opinions, since the Court has previously ruled in this matter that such an approach is inappropriate when evaluating disgorgement of profits, and also given the purpose of the disgorgement of profits remedy as I understand it. My opinions in that regard are detailed in Section 4.
15. I also find Dr. Leonard's calculation of expense deductions to be unreliable in that it improperly allocates certain costs to the Android business, while overstating others. Notably, Dr. Leonard has included certain costs in his profit calculation that his former colleague and Google's prior damages expert (Dr. Cox) did not. I also believe that Dr. Leonard's approach to allocating G&A costs based on engineering headcount is cursory and unsupported. The Court's prior orders also require a causal nexus between revenues and expenses in order to support such deductions; I find no basis in what Dr. Leonard has set forth to establish such a nexus. My opinions in that regard are detailed in Section 4.5.
16. With specific regard to the "top-down" and "bottom-up" apportionment methodologies put forth in the Leonard Report, I believe neither reflects a reasonable basis by which Google's causally connected profits can be apportioned. With specific regard to the "top-down" approach, Dr. Leonard's "lines of code analysis" is factually unfounded based on analysis of the code performed by Oracle's technical experts and more importantly, runs contrary to my understanding of how to apply the relevant case law in that it is a mechanical approach that fails to properly account for the relative contribution of the Infringed Java Copyrights to the success of the platform under the actual business circumstances faced by Google. With regard to Dr. Leonard's cost-based "bottom-up" approach, he fails to recognize the difference between cost and value, fails to recognize the importance of Google's timely market entry and fails to recognize that this Court has already rejected a cost-based analysis for the purpose of apportioning Google's causally connected profits. Cost avoidance is a theory of unjust enrichment rather than disgorgement of profits. My opinions in that regard are detailed in Sections 4.6 and 4.7.
17. Given Google's failure to put forth a reasonable apportionment methodology, I have performed my own apportionment analysis which measures the Platform Contribution provided for by the Infringed Java Copyrights. My determination of the Platform Contribution is based on a weighted average analysis of what Google pays to others for the contribution of their non-Android mobile platforms in connection with generating search advertising revenue. I find that arms' length market-based negotiations provide objective evidence that mobile platforms contribute approximately 36 percent of value to mobile advertising.
18. My opinion is consistent with the legal theory of commingling in that it reflects 100 percent of the value of the Platform Contribution. Commingling occurs when the infringer has mixed the infringing and noninfringing attributes in a way that makes it difficult or impossible to separate out



the respective contributions of each to overall profits attributable to the accused work. I find application of that legal theory would be appropriate in this case because Google knowingly assumed the risk of its failure to obtain a license and created the scenario whereby the relative contributions of the 37 Java APIs (“Java APIs”)² to the total Platform Contribution are difficult to discern. My opinion is also consistent with the overall business circumstances. As previously described, Google faced an extremely competitive landscape with a very limited window of opportunity, and had to obtain the cooperation of numerous other business actors in order to make a successful launch of the Android Platform. Those business actors were familiar with (and comfortable with) Java in mobile phones. Java represented a significant portion of the market at the time, and Google overtly capitalized upon that familiarity and comfort with the very important audience of carriers and OEMs. Furthermore, the technical expert evidence also shows that Android and its most important applications are dependent upon the Java APIs, that the Java APIs provided stability to the Android Platform during the critical launch period, and that the Java APIs are centrally important to the Android Platform. Under these circumstances, use of the commingling legal theory is appropriate because the Java APIs are properly viewed as a “gating item” to the Android Platform. Examples of certain presentations I have reviewed are provided below and a summary of all the presentations I have reviewed to date can be found in the Exhibits attached to my report.

- In a 2006 pitch to T-Mobile, Google states “Supporting Java is the best way to harness developers: The wireless industry has adopted Java, and the carriers require its support” and plans to “leverage Java for its existing base of developers.”³ Additional slides include reference to Android Runtime including Core Java libraries and Java Virtual Machine; application level Java interface to telephony sub-system, standard Java class libraries, Java developer tools, Java application framework, and a constrained time frame.⁴
- In 2006, a presentation made to LG included references to a “powerful, simple Java Application Framework”⁵ and “Standard Java Class libraries; MIDP 2.0 support.”⁶ Also a presentation made to BenQ listed references to specific JSRs, J2ME and CDC 1.1.7

² I understand ‘37 Java APIs’ to refer to the declaring code and the structure, sequence and organization of the 37 Java APIs packages at issue.

³ GOOGLE-24-00147891, slide 39.

⁴ GOOGLE-24-00147891, slides 40, 56, 59, 60, 71, 73 and 77.

⁵ GOOGLE-24000152227, p. 3.

⁶ GOOGLE-24-00152227, p. 25.

⁷ GOOGLE-24-00013099, p. 7.



- Android overviews touting a “powerful simple Application Framework”⁸ and a Telephony middle layer with Java at the phone application layer⁹ were presented to LG¹⁰, Asian OEMs¹¹ and Qualcomm.¹²
19. Based on the outcome of that analysis, it is my opinion that the amount of Google’s profits which meet the causal nexus test and are related to infringing attributes of the Android Platform is \$8.8 billion. My apportionment methodology and related opinions are detailed in Section 7 of this report.
20. A summary of my current opinions regarding Oracle’s actual damages and the portion of Google’s causally connected profits which relate to the Infringed Java Copyrights is provided in the following Figure.

Figure 1
Summary of Opinions

Measure of Monetary Recovery	Amount (in Billions)
Oracle's Actual Damages	\$0.475
Profits Apportioned to Infringed Java Copyrights	\$8.829

21. The specific bases for my opinions are provided throughout the remainder of this report and my Initial Report as well. In summary however, my opinions are supported by each of the following facts:
- The Infringed Java Copyrights were critically important to the timing of Google’s launch of the Android platform, especially considering the business circumstances at the time and the nature of platform economics outlined by Dr. Jaffe in his report.
 - Google’s strategy in launching Android as a mobile platform was to ensure a continuing revenue stream from its search services in connection with mobile advertising. Mobile search has generated significant advertising revenue and profit for Google, and the Android platform is a critical component of Google’s overall mobile search business.
 - The Infringed Java Copyrights are necessary for and critically important to the ongoing operation of the Android Platform and its applications.

⁸ GOOGLE-03-00146539, p. 3.

⁹ GOOGLE-03-00146539, p. 19.

¹⁰ GOOGLE-01-00066237 and GOOGLE-01-00066262.

¹¹ GOOGLE-03-00139402.

¹² GOOGLE-03-00146539, GOOGLE-03-00147537.



- Absent Google's use of the Infringed Java Copyrights, Sun would have generated significantly more licensing revenue at least from its Java ME platform.
 - Absent Google's use of the Infringed Java Copyrights, Sun was strategically positioned to introduce a successful mobile platform, either itself or through a licensee.
22. As seen in the sections that follow, this report first provides a response to certain opinions put forth in the Leonard Report. That response begins with a discussion of certain methodological errors reflected in the Leonard Report before moving on to discuss certain inadequacies in Dr. Leonard's opinions relating to the identification, quantification and apportionment of Google's causally connected profits. Next, I respond to Dr. Leonard's opinions regarding Oracle's lost profits, as well as several technical issues upon which Dr. Leonard has opined. Finally, I consider my initial opinions in light of Dr. Leonard's views, and put forth my responsive opinions regarding the portion of Google's causally connected profits which relate to the infringing attributes of the Android platform.

4. RESPONSE TO DR. LEONARD'S UNJUST ENRICHMENT OPINIONS

4.1 Dr. Leonard's Summary of My Causal Nexus Analysis is Incorrect

23. Dr. Leonard states:

Mr. Malackowski's causal nexus argument can be summarized as follows: if the allegedly infringing material were removed from Android (and Google was not allowed within the counterfactual to adjust Android in any way,) Android would not work, and Google would not earn any of the associated revenues and profits.¹³

This is a gross oversimplification of the opinions put forth in my Initial Report, particularly with regard to Section 11.1 in which I describe (in detail) how the Infringed Java Copyrights are causally connected to the Android profits.

24. Dr. Leonard ignores both the technical evidence and the business evidence. I relied not just upon the notion that Android would not work without the Java APIs, although that certainly is true based upon the findings of the technical experts - including Google's own technical expert Dr. Astrachan.¹⁴ Beyond that causal relationship, there is also the technical work done to show that the Java APIs are central to the Android Platform and important applications, including Google's applications, and that they lent a great deal of stability to the platform during its critical launch window.¹⁵
25. Dr. Leonard also ignores the fact that the carriers were familiar with, and already dependent upon, Java-based systems, and considered Java the dominant mobile platform at the time Google was

¹³ Expert Report of Dr. Leonard, February 8, 2016, p. 15.

¹⁴ Rebuttal Expert Report of Dr. Astrachan, February 8, 2016, ¶¶ 61, 63 and 82.

¹⁵ Expert Report of Dr. Kemerer, February 8, 2016, ¶ 78.



seeking to break into the market. Without the carriers, Google would not have been able to launch a new platform. Google recognized this problem and spent many months making presentations to carriers and OEMs in which it touted the fact that Android would be Java-based. Google used this existing familiarity with Java to develop support during the critical development window in 2006 and 2007 while it put together the Open Handset Alliance. A summary of the presentations I have reviewed to date can be found in the Exhibits attached to my report.

26. In addition, the platform economics as described by Dr. Jaffe further underscores the great significance of the business circumstances faced by Google in 2006 when it made the “final” decision to build a Java-based system, as set out in my Initial Report. As explained by Dr. Jaffe, multi-sided platform markets like this one are very limited in their opportunities for success and depend upon critical gating actors who are beyond the control of the platform provider. In this matter, those gating actors were the OEMs and carriers.
27. This is exactly what Google contemplated when it created the Android Platform. Because Android was Java-based, it would be credible with OEMs and be adopted quickly. OEM adoption would create a multi-sided platform that Google controlled, permitting Google to derive revenue from mobile advertising and Google searches initiated from Android devices. As described in its strategy documents, Google considers advertising revenue to be part of the “Direct Revenue Impact” of the platform.

Figure 2
Google Strategy Document





28. This is further confirmed by statements made by Eric Schmidt in earnings calls who stated that Android was “hugely profitable,”¹⁶ and in interviews given by Andy Rubin who agreed that, because of Google’s advertising model, Android is profitable by itself even though Google does not charge for the Android product.¹⁷
29. Further, Dr. Leonard’s alleged counterfactual causal nexus approach suffers from numerous flaws, as discussed further below.

4.2 Dr. Leonard’s Counterfactual Approach to Causation is Improper

30. Dr. Leonard’s approach to determining the causal connection between the infringement and Google’s revenues and profits is unreliable. Dr. Leonard relies on an incomplete and unrealistic construction of a “counterfactual” world.¹⁸ Dr. Leonard’s “counterfactual” approach to determining causation is explained in his report as follows:

Speaking as an economist, the appropriate conceptual way to measure the causal effect of a factor on an outcome variable is to compare the difference in the outcome variable between the actual world and the counterfactual where the factor in question is altered exogenously from its actual value and the rest of the system is allowed to adjust.⁹ In the case of an economic system, this means that the economic actors are allowed to reoptimize and choose new actions in the counterfactual.¹⁹

31. I understand Dr. Leonard’s counterfactual approach to evaluating causation to be a “but-for” analysis which assesses the change in the market and the actions Google would have taken, had it not illegally used the Infringed Java Copyrights. While such “but-for” analyses have their place in assessing intellectual property damages, I do not believe that they are relevant to evaluating causation in connection with copyright infringement disgorgement of profits.
32. The relevant inquiry for copyright infringement disgorgement is the profits of the infringer attributable to the infringement, not cost savings or a speculative and unsupported counterfactual analysis that ignores important economic elements such as the dynamic and unpredictable nature of platform competition.²⁰
33. My understanding from counsel is that the copyright disgorgement remedy is supposed to preclude the possibility that such a defendant benefits from the infringement. By permitting the infringer to

¹⁶ <http://www.morningstar.com/earnings/printtranscript.aspx?id=18282869>.

¹⁷ <http://allthingsd.com/20101214/d-dive-into-mobile-the-full-interview-video-of-google-androids-andy-rubin/>.

¹⁸ Expert Report of Professor Adam Jaffe, February 29, 2016, ¶ 19.

¹⁹ Expert Report of Dr. Leonard, February 8, 2016, p. 13.

²⁰ I understand from counsel that the reason for this is that copyright infringement typically results from intentional acts. Except in rare cases, infringers do not copy by accident—they know they are undertaking an act that involves reproducing the material of another. Unlike patents which might be infringed entirely by accident and without knowledge of any kind of an underlying right, copyright infringement generally occurs only when a defendant has knowingly copied something—even if that copying was not also a knowing infringement.



“reoptimize and choose new actions” the Court would be permitting Google to escape the consequences of its actions because of what it *might* have done, even though it did not in fact pursue that alternative approach. Such an approach improperly ends up allowing Google to retain profits that were in fact generated by the infringement in the real world.

34. Although Dr. Leonard “speaks as an economist” when explaining his counterfactual approach to copyright disgorgement causation, he cites to no case law, economic treatise or peer reviewed article to support his opinion that the application of this approach is appropriate.
35. I am not aware of any damages treatise or peer reviewed article that supports Dr. Leonard’s counterfactual approach to evaluating causation in connection with a copyright infringement disgorgement analysis. On that point, in connection with preparing this report, I reviewed each of the following texts in search of any such reference. I found none.
 - Litigation Services Handbook, The Role of the Financial Expert (Second Edition), Roman L. Weil, Michael J Wagner, Peter B. Frank (1995);
 - Litigation Services Handbook, The Role of the Financial Expert (Third Edition), Roman L. Weil, Michael J Wagner, Peter B. Frank (2001);
 - Economic Approaches to Intellectual Property, Dr. Gregory K. Leonard and Dr. Lauren J. Stiroch (2005);
 - Intellectual Property Valuation, Exploitation and Infringement Damages, Gordon v. Smith and Russell L. Parr (2005);
 - Economic Damages in Intellectual Property, Daniel Slottje (2006);
 - Litigation Services Handbook, The Role of the Financial Expert (Fifth Edition), Roman L. Weil, Daniel G. Lentz, David P. Hoffman (2012);
 - Assets and Finances: Calculating Intellectual Property Damages, Richard B. Troxel and William O. Kerr (2014);
36. In addition to reviewing the above texts, I have also reviewed the model jury instruction for the Ninth Circuit as it relates to the evaluation of causation in copyright matters and have found no reference to Dr. Leonard’s counterfactual approach.
37. Dr. Leonard also argues that I “agree” with him that a counterfactual world is a necessary consideration of the causal nexus in a disgorgement analysis because my Initial Report discusses commercially available noninfringing alternatives. This is incorrect. My Initial Report discusses the alternatives actually considered and rejected in the real world by Google, which strongly supports the notion that the Java APIs were a gating item to the Android Platform. This is not a discussion of a counterfactual world. It is a discussion of the real-world business limitations that were faced by Google at the time.
38. With this understanding in mind, I further address the flaws reflected in Dr. Leonard’s counterfactual analysis, as discussed in the paragraphs that follow.



39. The substantial amount of growth in the developer community, the increase in mobile data use, and the transformation of mobile handsets during Google's unique window of opportunity (none of which were considered by Dr. Leonard), make his attempt to construct a "but-for" (counterfactual) world highly speculative.²¹
40. Nowhere does Dr. Leonard explain how his non-existent "counterfactual" world would have arisen to exclude Java, despite the clear market circumstances at the time. As explained by Dr. Jaffe, it does not make sense to think that Apple would have achieved all of the market share because it was considered the high-end platform. There was room for another platform, as 80% of the market at that point was already using, and therefore familiar with, Java. Sun had already licensed Java SE for use in smartphones, and one of those phones was presented as the new device of the year at JavaOne in 2006.²² Sun was also poised to offer additional SE-based smartphones in higher functioning devices either itself or through another licensee such as SavaJe. Dr. Leonard provides absolutely no support for how his counterfactual world would have developed without significant participation (and therefore earned revenues) by Java.
41. Dr. Leonard inappropriately uses an untested, unproven and unaccepted model to estimate the decrease in Android handset sales that would have occurred in a counterfactual world where there were fewer Android apps, as well as the percentage of the Android sales decrease that would have been captured by the iPhone. Dr. Leonard uses the model, which was developed for an entirely different purpose, to estimate the amount of ad revenue he asserts Google would have earned on those additional iPhone units and relies on that conclusion in connection with forming his opinions.²³ Dr. Leonard uses little, if any, evidence produced in this case to perform this analysis. Instead, he applies theoretical formulas to third party data which is disconnected from the evidence produced in this matter.
42. Dr. Leonard also inappropriately provides an alternate lost profits opinion in which iPhone is granted a larger portion of the "but-for" market based on a diversion ratio resulting from the counterfactual analysis. However, that analysis is flawed for the same reason. Dr. Leonard applies a model that was developed for a different purpose under a different set of assumptions about the smartphone market. I address each of the following points in response to Dr. Leonard's counterfactual approach and its application to his damages opinions:
 - Dr. Leonard's reliance on the Berry Model is improper
 - ✓ The Berry Model has limitations, according to Berry
 - ✓ Kim's application of the Berry Model makes it unreliable
 - Dr. Leonard's reliance on the Kim Model is also improper

²¹ Expert Report of Professor Adam Jaffe, February 29, 2016, ¶ 19-58.

²² <http://news.softpedia.com/news/Jasper-S20-Java-Powered-Mobile-Phone-23841.shtml>.

²³ Expert Report of Dr. Leonard, February 8, 2016, p. 90.



- ✓ The smartphone share calculation is unreliable
- ✓ The app share calculation is unreliable
- ✓ Kim's "but for" model neglects consideration of market participants²⁴
- ✓ The Kim Model ignores significant aspects of the counterfactual world

4.3 Dr. Leonard Improperly Applies the Berry Model

43. Dr. Leonard performs calculations based on a 1994 Berry article entitled "Estimating Discrete-Choice Models of Product Differentiation" which proposes "estimation by 'inverting' the market-share equation to find the implied mean levels of utility for each good".²⁵

*This article considers the problem of estimating supply and demand models in markets with product differentiation. In common with some previous articles, market demand is derived from a general class of discrete choice models of consumer behavior. The utility of consumers depends on product characteristics and individual taste parameters; product-level market shares are then derived as the aggregate outcome of consumer decisions. Firms are modelled as price-setting oligopolists, and endogenous market outcomes are derived from an assumption of Nash equilibrium prices.*²⁶

4.3.1 The Berry Model Has Limitations, According to Berry

44. Even the 1994 Berry Inversion paper which Dr. Leonard relies on describes inherent limitations with the approach, rendering it inapplicable in this matter.²⁷ For example, "I should emphasize in closing that the techniques of this article rely on a number of restrictive assumptions. These include assumptions that demand is well approximated by a static discrete-choice model and that the distribution of consumer tastes is known up to a parameter vector. More importantly, and more difficult to solve, I assume that product characteristics are economically exogenous."²⁸ Additionally, the paper states: "Also, in practice, the number of product characteristics that are important to consumers may be much larger than the number of observations available to the econometrician, making it impossible to estimate the separate effects of each characteristic."²⁹

4.3.2 Dr. Leonard's Application of the Berry Model is Unreliable

45. Dr. Leonard's application of the Berry inversion is not a peer accepted model amongst damages experts. I understand "discrete choice models" model choices consumers make between a set of alternatives.³⁰ Google's ability to enter the mobile handset market and gain unexpected success

²⁴ Although Blackberry is also considered in Dr. Leonard's calculations, this alone does not account for the unknown nature of what other players would have played a material role in the but-for market.

²⁵ "Estimating discrete-choice models of product differentiation," Steven T. Berry, 1994.

²⁶ "Estimating discrete-choice models of product differentiation," Steven T. Berry, 1994.

²⁷ "Estimating discrete-choice models of product differentiation," Steven T. Berry, 1994.

²⁸ "Estimating discrete-choice models of product differentiation," Steven T. Berry, 1994.

²⁹ "Estimating discrete-choice models of product differentiation," Steven T. Berry, 1994.

³⁰ "Estimating discrete-choice models of product differentiation," Steven T. Berry, 1994.



provides evidence of the unique opportunity window that existed at that time. Additionally, the model ignores the possibility of the introduction of a successful smartphone operating system by any other market participant.

46. I understand that utility in the economic sense represents the amount of satisfaction of consuming a good or service. Dr. Leonard ignores the fact that different types of consumers choose the iPhone, as compared to an Android device, as well as the fact that consumer preference may have differed in the market absent Android.
47. Even as to consumers, mobile handset demand is not based entirely on apps alone; there are other features that contribute to consumer demand for a mobile handset, as Dr. Leonard notes throughout his report. Also, not all users value apps the same, as the Kim Model states: “iPhone users receive higher utility from an app of same quality than Android users do, which may be because iPhone users are more likely to love apps in general than Android users”.³¹
48. For at least these reasons, Dr. Leonard’s use of the Berry Model is not an accepted method for the determination of damages or a “but-for” estimation of the non-infringing market and, as such, it should be rejected in its entirety. These flaws are only compounded by Dr. Leonard’s use of the Kim Model.

4.4 Dr. Leonard’s Application of the Kim Model is Improper

49. Dr. Leonard relies on an empirical economic model of smartphone demand developed by Min Jung Kim, an economics doctoral candidate from the University of Minnesota, to arrive at the diversion ratio in conjunction with the Berry Model.³² The “Kim Model” is a dissertation thesis written by a PhD candidate that, to my knowledge, was not published in any peer-reviewed journals and has not been accepted by the courts as an appropriate damages methodology. Dr. Leonard errs in relying on an empirical model that has not been peer-reviewed or accepted for a determination of damages.
50. The inputs used by Dr. Leonard in the Kim Model are also unreliable. Dr. Leonard describes the share calculations as follows:³³
 - **Smartphone Share:** The share of a smartphone OS in a given month - defined as the U.S. unit handset sales in that month divided by the U.S. population over the age of ten.
 - **App Share:** An app’s market share - defined as the number of downloads of the app in a given month divided by the handset sales of the OS in that month.

³¹ “Essays on the Economics of the Smartphone and Application Industry,” Min Jung Kim, 2013, p. 41.

³² “Essays on the Economics of the Smartphone and Application Industry,” Min Jung Kim, 2013.

³³ Expert Report of Dr. Leonard, February 8, 2016, p. 92.



Dr. Leonard's report and exhibits do not show his calculations of these shares or how he relies on the results of these two calculations to ultimately arrive at his recapture percentages or diversion ratio. Despite exclusion of his calculations, I address the flaws in his descriptions of these inputs.

4.4.1 The Smartphone Share Calculation is Unreliable

51. Dr. Leonard's calculation of smartphone share is based on U.S. handset sales and the entire U.S. population over ten. This basis assumes every person in the U.S. over the age of ten owns a mobile handset. While a growing portion of the population owns a mobile handset, this spreads each smartphone OS across too broad of a population and thus the results are likely to be inaccurate. As a point of reference, 35% of the adult U.S. population owned a smartphone in 2011 and 68% in 2015.³⁴
52. These variables and inputs appear arbitrary, as the relevance of the number of people over the age of ten to total U.S. handset sales is unclear. There is no evidentiary support for assuming that all people over the age of ten in the U.S. have handsets or even represent a meaningful population relevant to this case. The Kim Model reveals a difference in handset use between different age groups stating: "richer and younger consumers prefer the iPhone over Android phones, and at the same time, they tend to like apps more".³⁵ Furthermore, focusing on only the U.S. handset market inappropriately portrays the worldwide market and ultimately applies a U.S. based analysis to worldwide revenues. In support of the differences between the U.S. and worldwide markets, the Kim Model states that the U.S. accounts for roughly 30% of global app downloads.³⁶

4.4.2 The App Share Calculation is Unreliable

53. Dr. Leonard improperly uses a calculation of the app share, or app utility to a smartphone user, as a variable in his counterfactual analysis. To determine which apps to use in this analysis, Dr. Leonard relied on the top paid and free app lists from AppAnnie data from January 2012 to December 2015.³⁷ According to Dr. Leonard's use of the model, any app in the following categories is assumed to be available on Android in the counterfactual, but apps in none of these categories are assumed to be unavailable in the counterfactual:
 - It is a Google App;
 - It was written using the NDK;
 - It was multi-homed on iOS;
 - Its developer also developed apps for iOS;

³⁴ <http://www.pewinternet.org/2015/10/29/the-demographics-of-device-ownership/>.

³⁵ "Essays on the Economics of the Smartphone and Application Industry," Min Jung Kim, 2013, p. 27.

³⁶ "Essays on the Economics of the Smartphone and Application Industry," Min Jung Kim, 2013, p. 2.

³⁷ Expert Report of Dr. Leonard, February 8, 2016, p. 92.



- Its developer also developed NDK Android apps.³⁸
54. Dr. Leonard's counterfactual analysis improperly only considers apps downloaded in the first month of owning a smartphone. The Kim Model acknowledges the limitations of this assumption: "apps that are already installed on the device upon purchase (factory-installed apps) may also create non-negligible economic value but they are not considered in the paper due to lack of data". Additionally, "one limitation of the study is that the possibility of different utilization of each app (e.g., depending on price and category) is ignored".³⁹
55. Lastly, in his applications of the counterfactual results, Dr. Leonard inappropriately uses 2012 as a proxy for all prior years. I understand that prior to 2012 there were fewer apps available on the market.⁴⁰ Since the number of apps was rapidly changing over the relevant period, Dr. Leonard's assumption that the 2012 share would be the same in prior years is also flawed. Additionally, the Kim Model indicates limitations with this assumption: "consumers who purchase smartphones earlier in time or choose a smartphone with a better app system are already predisposed to purchasing apps."⁴¹
56. Despite these core flaws rendering the Kim Model unreliable for Dr. Leonard's purpose, Dr. Leonard uses these smartphone and app shares in a series of ill-described calculations that are based on a number of flawed or undisclosed assumptions to purportedly calculate the:
- The decrease in Android's sales; and
 - The increase in iPhone sales in the counterfactual relative to their actual levels.⁴²
- He then takes the weighted averages to calculate (again in an unclear way) by year:
- The percentage Android sales decrease in the counterfactual; and
 - The percentage of the Android sales decrease in the counterfactual that is captured by the iPhone (the "diversion ratio")⁴³

4.4.3 Use of the Kim and Berry Models to Determine a "But-For" World Neglects Consideration of Other Market Participants

57. As part of Dr. Leonard's determination of the number of additional iPhone units that would have been sold in the counterfactual, he assumes "Apple would have had time to expand its supply of iPhones and, indeed, the capacity in the various component industries made available by the lower

³⁸ Expert Report of Dr. Leonard, February 8, 2016, pp. 92-93.

³⁹ "Essays on the Economics of the Smartphone and Application Industry," Min Jung Kim, 2013, p. 16.

⁴⁰ Exhibits 1b, 3d.2, 3d.3, 4e, and 4f to the Expert Report of Dr. Leonard, February 8, 2016.

⁴¹ "Essays on the Economics of the Smartphone and Application Industry," Min Jung Kim, 2013, p. 27.

⁴² Expert Report of Dr. Leonard, February 8, 2016, pp. 93.

⁴³ Expert Report of Dr. Leonard, February 8, 2016, p. 93.



Android handset sales could have been utilized by Apple.”⁴⁴ This is untrue as Apple has experienced numerous supply shortages when releasing its iPhone products.⁴⁵ In fact, it has suffered from supply shortages almost every time it has released an iPhone. Yet, Dr. Leonard’s analysis simply assumes away that real world fact.

58. This assumption also ignores other players in the market with access to those same resources. While Android sales may have dropped, Dr. Leonard’s model ignores that another entity with their own OS may have required the same resources in a “but for” Android world. Additionally, it suggests Apple’s closed environment would have monopolized the smartphone market which ignores the success that resulted from Android’s free open source model. Android was able to compete with Apple and, “but-for” Android, other parties could have competed as well.⁴⁶ There were already numerous other participants in the market, including Microsoft and Nokia with their own platforms, and numerous players selling Java-based devices. Indeed, without more detailed information related to Apple’s supply chain, it is unreasonable even to assume that Apple would have had the capacity to make all of the additional Android related sales.

59. Absent Android, which secured a number of critical relationships to gain its success, parties would have formed different relationships and continued to compete in the mobile handset market.

[REDACTED]
[REDACTED]⁴⁷ [REDACTED]
[REDACTED]⁴⁸ [REDACTED]
[REDACTED]⁴⁹ [REDACTED] to expect OEMs to do nothing to successfully compete with iPhone in the counterfactual world is inappropriate. Android’s success ceased much of the activity by competitors and became a barrier to entry. Guessing what would have occurred without its rapidly successful presence in the market requires too many assumptions for a reasonable damages opinion.⁵⁰

60. Assuming Android would have existed without Google’s infringement is also speculative. It would have taken Google longer to get to market had it not used the Infringed Java Copyrights.⁵¹ Given the unique window of opportunity in the mobile space at the time, a delay would have altered the market dynamics.

⁴⁴ Footnote 286 to the Expert Report of Dr. Leonard, February 8, 2016, p. 93.

⁴⁵ <http://www.pcmag.com/article2/0,2817,2366762,00.asp>, <http://www.cnet.com/news/iphone-6s-plus-in-short-supply-due-to-production-issues-says-analyst/#!>; <http://www.zdnet.com/article/iphone-5s-reportedly-in-short-supply-for-fridays-launch/>.

⁴⁶ Expert Report of Professor Adam Jaffe, February 29, 2016, ¶¶20-41.

⁴⁷ OAGOOGL0002778854-882 at 855 and 869.

⁴⁸ OAGOOGL0000799926; <http://www.pcmag.com/article2/0,2817,2366762,00.asp>.

⁴⁹ OAGOOGL0000799926; OAGOOGL0000457616-617 at 617.

⁵⁰ I note that these issues are further discussed in the section of my report which responds to Dr. Leonard’s comments concerning my lost profit opinions.

⁵¹ Expert Report of Professor Adam Jaffe, February 8, 2016, ¶¶196 and 199.



4.4.4 The Kim Model Ignores Significant Aspects of the Counterfactual World

61. Without the market power from the success of Android, Google likely would have been in a much different bargaining position. While it is difficult to reconstruct a smartphone market absent Android, a few observations can be made as to the likely “but-for” world. First, it is likely that an alternative player in the market would have competed with iPhone.⁵² It is also likely that Google’s profitability would have suffered absent the market power resulting from Android’s success, because Google would have faced greater competition for access to mobile apps, advertising, and browser traffic. Absent Android, Google would likely have been much less relevant to the mobile handset industry since it would not directly participate. The concern of exactly this circumstance developing is what drove Google to copy the Java APIs without permission rather than develop its own. Thus, implying Google would have earned additional revenue on improperly determined additional iPhone units does not consider how Google’s weakened bargaining position would have impacted its relationship with Apple.
62. Based on the above, Dr. Leonard’s counterfactual model is unreliable for use in a damage calculation. It admittedly does not take into account a myriad of alternatives and factors that clearly would have impacted the smartphone market “but for” Android’s use of the Infringed Java Copyrights. These limitations of Dr. Leonard’s counterfactual model render the results irrelevant to the determination of damages in this case.

4.5 Dr. Leonard’s Analyses of the Profit Google Realized from Android Are Defective

63. Dr. Leonard’s quantification of the profits Google realized through the development and commercialization of the Android operating system (as reflected in Leonard Exhibits 1a.1 and 1a.4) are both defective and unreliable for at least the reasons set forth below.

4.5.1 Dr. Leonard Substantially Understates “Android-Related Profits” (Leonard Ex. 1a.1)

64. Dr. Leonard’s “top-down” “Android-Related Profits” analysis begins in Leonard Exhibit 1a.1 and continues to Leonard Exhibit 3e. It results in “Android-Related Profit” of [REDACTED] and “Android-Related Profit (Apportioned to the 37 APIs)” of \$56.3 million. Dr. Leonard’s calculation of “Android Related Profits” is similar to the summary of Google’s reported Android operating results in Revised Exhibit 7 attached hereto. In fact, only the following three cost/expense line items are different: 1) Traffic Acquisition Costs (a cost of sale), 2) “Android General and Administrative Expense” (an operating expense), and 3) “Incremental Search and Advertising Expense” (an operating expense). Each of these line items is discussed below:

4.5.2 Dr. Leonard Effectively Double-Counts Search Traffic Acquisition Costs (TAC)

65. In Leonard Exhibit 1a.1, Dr. Leonard quantified Android-related TAC of [REDACTED] for the eight-year period 2008 to 2015. This amount is substantially overstated. As reflected in Revised Exhibit

⁵² Expert Report of Professor Adam Jaffe, February 29, 2016, ¶ 16.



7 attached hereto, my calculation of Android TAC for the same eight-year time period totals [REDACTED]

66. Dr. Leonard calculates 2011 to 2015 Android TAC in Leonard Exhibit 1d. In that Exhibit, Dr. Leonard utilizes total annual AdWords, AdSense and Display Revenue and TAC for “Google as a whole”⁵³ to estimate Android-related TAC. Annual AdWords (i.e., Search) TAC in Leonard Exhibit 1d⁵⁴ compares closely to the annual TAC payments to “Non-Android Mobile Operating System Partners,”⁵⁵ as reported in the Google record at Docket No. 1436 of this matter. Annual AdWords TAC in Leonard Exhibit 1d also compares closely to the annual “TAC Paid to Distribution Partners,” figure Google reported in its Forms 10-K.⁵⁶ The Figure below provides a summary of Google’s reported: 1) TAC for AdWords;⁵⁷ 2) TAC paid to “Non-Android Mobile O.S. Partners,”⁵⁸ and 3) TAC “Paid to Distribution Partners,”⁵⁹ for the years 2011 to 2014.

Figure 3⁶⁰

Comparative Analysis: AdWords TAC v. TAC Paid to Distribution Partners

Source of Data	2011	2012	2013	2014
Google Total AdWords TAC	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
TAC Paid to "Non-Android Mobile O.S. Partners"	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Google Total "TAC Paid to Distribution Partners"	\$1,517.0	\$2,165.0	\$2,965.0	\$3,633.0

67. As the above Figure illustrates, the annual AdWords TAC figure utilized by Dr. Leonard represents nearly [REDACTED] of the total annual TAC paid to “Non-Android Mobile O.S. Partners,” as reported to this Court in Docket No. 1436, and nearly [REDACTED] of the total annual “TAC Paid to Distribution Partners,” as Google reported in its Forms 10-K. Based on my review of the record evidence, I conclude that the annual AdWords TAC figures are captured in and are a part of “Non-Android Mobile O.S. Partners” and “TAC Paid to Distribution Partners.” Stated differently, all three of these cost descriptions capture the same AdWords-related TAC paid to Non-Android

⁵³ See Email from Daniel Purcell to Annette Hurst, November 8, 2015.

⁵⁴ GOOG-00022380; for “Google as a whole.” See Email from Daniel Purcell to Annette Hurst, November 8, 2015.

⁵⁵ See Exhibit 14; Case No. CV 10-03561 WHA, Docket No. 1436; “Google Search Distribution Agreements with Non-Android Mobile Operating System Partners.”

⁵⁶ Google 2013 Form 10-K, p. 31; Google 2014 Form 10-K, p. 26.

⁵⁷ GOOG-00022380; for “Google as a whole.” See Email from Daniel Purcell to Annette Hurst, November 8, 2015.

⁵⁸ See Exhibit 14; Case No. CV 10-03561 WHA, Docket No. 1436; “Google Search Distribution Agreements with Non-Android Mobile Operating System Partners.”

⁵⁹ Google 2013 Form 10-K, p. 31; Google 2014 Form 10-K, p. 26.

⁶⁰ See Exhibit 14.



Distribution Partners. That is: all three costs descriptions represent the same dollars paid to Non-Android Distribution Partners.

68. As indicated in my Initial Report, the Android-related Distribution Partners to which Google pays TAC are primarily wireless carriers. Google developed and commercialized the Android operating system to, among other things, avoid paying TAC to other mobile platforms to direct Internet traffic to Google websites. As discussed in my Initial Report, the Android-related TAC Google pays to wireless carriers is captured and accounted for in Android Profit and Loss Statements as Apps and Digital Content Cost of Sales.⁶¹
69. According to Dr. Leonard, “Apps COS includes payments for developers, credit card fees and payments to carriers,”⁶² and “Digital Content COS . . . include payments to carriers, credit card companies and content owners, such as publishers.”⁶³ A May 2015 Google presentation entitled “Introduction to Android” indicates that Google expected to pay approximately [REDACTED] of TAC in 2015 to its Android carrier Distribution Partners, OEMs, and Retail Partners through revenue-sharing agreements, channel incentives, and rent.⁶⁴ To the extent Google actually incurred these costs, they are captured in Revised Exhibit 7 as App Cost of Sales, Digital Content Cost of Sales, and likely Sales Expense and Marketing Expense.⁶⁵
70. According to Mr. Jonathan Gold:
- Q. What are the carriers being paid for?*
- A. The bulk of this is Google Play rev share for the payment processing, and then there’s a portion of it that is related to traffic acquisition costs for Google.com when carriers choose to set Google as the default search.*
- Q. And what are the OEMs being paid for?*
- A. Similar things. . . But largely that is for Google.com rev share.*
- Q. And what are the retailers being paid for?*
- A. This is almost entirely rent in the cases of selling things from Chromecast to trying to encourage third-party devices to be sold.⁶⁶*
71. Because the TAC that Google pays its Android Distribution Partners is accounted for in the Android Profit and Loss Statements summarized in Revised Exhibit 7, primarily as Apps and Digital Content Cost of Sales, Dr. Leonard’s inclusion of AdWords TAC (alternatively described as “TAC Paid to “Non-Android Mobile O.S. Partners”) in his calculation of Android-related TAC

⁶¹ My Initial Report, pp. 119-120.

⁶² Expert Report of Dr. Leonard, February 8, 2016, p. 22.

⁶³ Expert Report of Dr. Leonard, February 8, 2016, p. 22.

⁶⁴ GOOG-00130338-386 at 340.

⁶⁵ Revised Exhibit 7.

⁶⁶ Deposition of Jonathan Gold, December 11, 2015, p. 185-186.



substantially overstates Android-related TAC. Thus, Dr. Leonard's calculation of Android-Related Profits in Leonard Exhibit 1a.1 is defective and unreliable.

72. My Android-Network-Member-related TAC calculation in Revised Exhibit 7.1 properly quantifies only the Google-Network-Member portion of annual TAC related to AdSense and Display that is not already accounted for in the Android Profit and Loss Statements reported by Google. Thus, my quantification of Android-related TAC accurately estimates the annual amounts of TAC incurred by Google.

4.5.3 General & Administration Allocation is Improper and Contrary to the Record Evidence

73. Dr. Leonard improperly deducts "Android General and Administrative" expenses of [REDACTED] in his "Android-Related Profits" calculation reflected in Leonard Exhibit 1a.1.⁶⁷ This deduction results in an understatement of "Android-Related Profits."
74. As indicated in my Initial Report,⁶⁸ during the relevant time period, Google regularly reported the profits it earned from the Android Platform to its Android Operating Committee, as well as to other Google executives. As set forth in my Initial Report, Google's contemporaneous business and financial records consistently identify the same cost of sales and operating expense line items as deductions from Android-related revenues in reporting Android-related profit.⁶⁹
75. The Profit and Loss Statements contained within these contemporaneously-prepared business records, in addition to other data, provide a basis for quantifying the costs and expenses that actually helped generate the revenues I have determined are causally connected to the Infringed Java Copyrights.⁷⁰ Revised Exhibit 7 is a summary of Android-related annual operating results as reflected in many of these contemporaneous business records.
76. Google retained Dr. Alan Cox in connection with the 2012 trial for this matter. On October 3, 2011, Dr. Cox issued the Expert Report of Dr. Alan J. Cox ("the Cox Report") which included a summary of "Profit and Loss Statements of the Android Platform" for the period January 2008 to September 2011 at Cox Exhibit 3b. The Figure below is an image of Cox Exhibit 3b which reflects all of the revenues (including, notably, "Android Gross Ad Revenues"), cost of sales, and operating expenses that Dr. Cox attributed to the Android platform as of September 2011. As the

⁶⁷ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 1a.1.

⁶⁸ My Initial Report, Paragraph 295.

⁶⁹ See, for example: GOOGLE-00303725 – 756 at 739; GOOGLE-01-00053552 – 591 at 556; GOOGLE-77-00053555 – 575 at 562; GOOG-00103813; GOOG-00100278 – 301 at 301; GOOG-00100391 – 408 at 401; GOOG-00104442 – 480 at 446; GOOG-00130338 – 386 at 342; GOOG-00131217 – 253 at 226; GOOG-00131428 – 461 at 452 and 456; GOOG-00132245 – 266 at 265; GOOG-00132508 – 534 at 518 and 532; GOOG-00132955 – 984 at 979; GOOG-00133825 – 856 at 851; GOOG-00186863 – 873 at 865; GOOG-00272276 – 298 at 286; GOOG-00272299 – 321 at 308; GOOG-00277550 – 585 at 559.

⁷⁰ Order Re Willfulness and Bifurcation, *Oracle America Inc. v. Google Inc.*, No. C 10-03561, September 18, 2015, p. 6-8.



following Figure illustrates, Dr. Cox did not allocate General and Administrative expenses to the Android platform.

Figure 4
Exhibit 3b to the October 3, 2011 Expert Report of Alan Cox

Line Item	2008	2009	2010	2011
	(Millions of U.S. Dollars)			
	(1)	(2)	(3)	(4)
Revenue¹				
Android Gross Ad Revenues	\$ 0.68	\$ 15.71	\$ 140.43	\$ 387.51
Nexus Phone (DTC) Revenues	-	-	115.18	-
Android Market Revenues	0.02	1.10	8.03	22.13
Total	\$ 0.7	\$ 16.8	\$ 263.6	\$ 409.6
Cost of Sales¹				
TAC ²	\$ 0.2	\$ 2.9	\$ 53.5	\$ 124.0
Operations	0.2	0.5	4.3	15.6
COS (incl. DTC)	0.0	0.3	109.9	9.9
Total	\$ 0.4	\$ 3.7	\$ 167.7	\$ 149.5
Operating Expenses¹				
Sales Expenses	\$ 0.9	\$ 3.2	\$ 5.2	\$ 6.6
Marketing ³	12.3	16.6	53.3	44.3
Product Management ("PM")	0.0	1.9	8.0	1.1
Total	\$ 13.20	\$ 21.71	\$ 66.45	\$ 51.92
Engineering Expenses ¹	\$ 86.3	\$ 41.2	\$ 99.7	\$ 129.5
Amortized Cost of Engineering Expenses ⁴	11.9	29.5	48.9	80.5
Legal Expenses	\$ 1.0	\$ 2.1	\$ 32.2	\$ 75.8

77. The General and Administrative expenses which Dr. Leonard allocates to the Android platform concern Google's finance and accounting, human resources, and real estate functions.⁷¹ Dr. Leonard allocates these expenses based on the number of Android engineers as a percentage of the total number of Google engineers.⁷² Dr. Leonard offers no economic, statistical, or other quantitative or qualitative analysis in support of the use of this metric as an allocation basis. To the contrary, Dr. Leonard cites primarily to "Conversations with Jonathan Gold" in support of his conclusions regarding the nature of and rationale for allocating these expenses. Without supporting quantitative or qualitative analysis, Dr. Leonard's allocation methodology is unreliable.
78. I understand that the Court has indicated that overhead expenses should be deducted "only when the infringer can demonstrate it was of actual assistance in the production, distribution or sale of the infringing product."⁷³ Dr. Leonard has not demonstrated that these General and Administrative expenses actually assisted in any of these corporate functions.

⁷¹ Expert Report of Dr. Leonard, February 8, 2016, p. 25.

⁷² Expert Report of Dr. Leonard, February 8, 2016, Exhibit 1e.

⁷³ Order Re Willfulness and Bifurcation, 3:10-cv-03561, Docket No. 1321, September 18, 2015, p. 10.



79. Given, among other things, the opinion of Google's previous expert, the nature of the allocated General and Administrative expenses, the Court's prior orders, and the contemporaneously-reported operating results for the Android platform which do not reflect [REDACTED] of General and Administrative expenses,⁷⁴ Dr. Leonard's allocation of these expenses to the Android platform is improper, and results in the understatement of his "Android-Related Profits."

4.5.4 "Incremental" Search and Advertising Expenses Do Not Relate to Android

80. Dr. Leonard improperly deducts "Incremental Search and Advertising" expenses totaling [REDACTED] in his calculation of "Android-Related Profits" as reflected in Leonard Exhibit 1a.1.⁷⁵ The deduction of these "Incremental Expenses" from Android revenues results in the understatement of Dr. Leonard's "Android-Related Profits."
81. Like the "Android General and Administrative" expenses discussed above, these "Incremental Search and Advertising Expenses" are not reflected in the contemporaneously prepared Profit and Loss Statements, as summarized in Revised Exhibit 7.
82. Like the "Android General and Administrative" expenses discussed above, the "Incremental Search and Advertising Expense" is also not reflected in Cox Exhibit 3b, as reflected in the above Figure. And, as discussed previously, I believe Dr. Leonard's inclusion of these costs is an improper attempt to offset the significant amount of Android related profit Google has generated since 2011, when Dr. Cox issued his initial report.
83. Furthermore, Dr. Leonard's own analyses undermine his conclusion that these "Search and Advertising Expenses" were incurred in connection with the Android platform. For example, in Exhibit 1b – iPhone Recapture Adjustment – Dr. Leonard subtracts these same "Incremental Search and Advertising Expenses" of [REDACTED] to derive an "iPhone Recapture Adjustment" of [REDACTED]. In doing so, Dr. Leonard implies that these expenses would have been incurred by Google regardless of whether the Android platform was developed and commercialized.
84. Likewise, in Leonard Exhibit 1a.4, Dr. Leonard excludes these expenses in his calculation of "Profit Apportioned to Android Versus Search/Ads Technologies and Services." In doing so, Dr. Leonard again implicitly concedes that none of these "incremental" expenses are actually attributed to Android, and that these expenses, in fact, relate only to Google's "Search/Ads Technologies and Services." If Dr. Leonard's ultimate opinion was that any portion of these "Incremental Search and Advertising Expenses" were actually incurred in connection with the Android platform, then some portion of these expenses would be reflected in this calculation.
85. Given, among other things, the opinions of Google's other experts, Dr. Leonard's own analyses, and the contemporaneously-reported operating results for the Android platform which do not

⁷⁴ As summarized on Exhibit 7 to my Initial Report.

⁷⁵ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 1a.1.



reflect [REDACTED] of “Incremental Search and Advertising Expenses,”⁷⁶ Dr. Leonard’s inclusion of these expenses in his calculation of “Android-Related Profits” is improper and results in an understatement of Google’s “Android-Related Profits.”

4.5.5 Dr. Leonard’s “iPhone Recapture Adjustment” is Defective

86. According to Dr. Leonard, “I determined that Google would recapture at least 44% of its ad revenue on Android handsets with ad revenue on iPhones.”⁷⁷ In connection with offering that opinion, in Leonard Exhibit 1b, Dr. Leonard calculates that Google would have recaptured [REDACTED] of profit from Ad Revenue “in the absence of Android.”⁷⁸ Dr. Leonard’s “iPhone Recapture Adjustment” is defective for several reasons, including at least the following.

4.5.5.1 Dr. Leonard Failed to Sufficiently Account for Differences in Price

87. According to Dr. Leonard, “[a]s a result of OEM’s product development efforts and the competition between OEMs promoted by Android, the prices of Android devices have decreased substantially over time, while their quality has improved dramatically. For example, between 2010 and 2015, the quality-adjusted contract price for an Android handset decreased from \$213 to \$14”⁷⁹ Leonard Exhibit 2a indicates that the per-unit Android contract price declined from \$213 as of Q1 2010, to \$88 as of Q4 2015.⁸⁰
88. Unlike Android prices, the prices of iPhones have remained relatively high. The Figure below illustrates annual iPhone prices, annual Android prices, and the pricing difference for the five-year period 2010 to 2014. As the Figure illustrates, iPhone prices ranged from a low of \$650 to a high of \$710, while Android smartphone prices declined from \$441 to \$254 during this time period.⁸¹

⁷⁶ As summarized on Exhibit 7 to my Initial Report.

⁷⁷ Expert Report of Dr. Leonard, February 8, 2016, p. 27.

⁷⁸ Expert Report of Dr. Leonard, February 8, 2016, p. 27 and Exhibit 1b.

⁷⁹ Expert Report of Dr. Leonard, February 8, 2016, p. 44.

⁸⁰ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 2a.

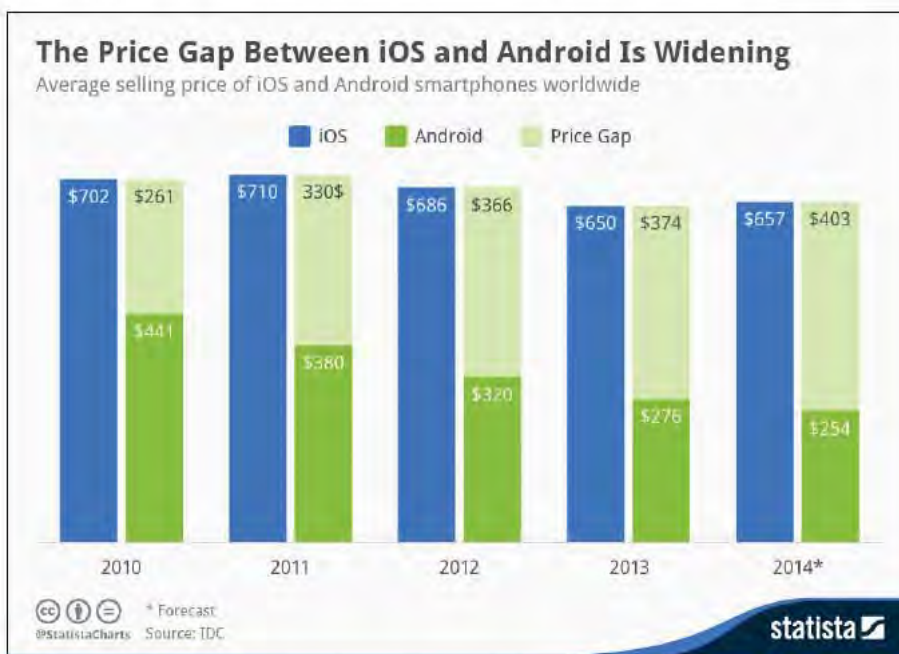
⁸¹ The Price Gap Between iOS and Android is Widening, Statista, Felix Richter, June 1, 2014; <https://www.statista.com/chart/1903/average-selling-price-of-android-and-ios-smartphones/>

**EXHIBIT G
PART 2 OF 6**

**REDACTED VERSION OF
DOCUMENT SOUGHT TO BE
SEALED**



Figure 5

Average Annual iPhone and Android Smartphone Prices – 2010 to 2014⁸²

89. Nowhere in the Leonard Report does Dr. Leonard discuss or evaluate the \$261 to \$403 price difference between iPhones and Android smartphones, or how this significant difference impacts his conclusion that 41 to 44 percent of Android Ad Revenue would have been “diverted” to users of iPhones during the eight-year period 2008 to 2015.⁸³ Without such an analysis, Dr. Leonard’s conclusions lack merit.

4.5.5.2 Dr. Leonard Fails to Provide Substantiating Analysis for Diversion Percentages

90. Leonard Exhibit 1b – iPhone Recapture Adjustment – utilizes annual “Diversion Ratios” of 40.5 to 44.0 percent to derive an “iPhone Recapture Adjustment” of [REDACTED]. According to Dr. Leonard, “[b]ased on an analysis discussed below, I determined that Google would recapture at least 44% of its ad revenue on Android handsets with ad revenue on iPhones. Applying this recapture rate to Android ad revenue yields the incremental ad revenue that Google would have made on the iPhone in the absence of Android.”⁸⁴ Notes to Leonard Exhibit 1b refer to Leonard 3d.2 “[f]or the diversion ratio.”

⁸² The Price Gap Between iOS and Android is Widening, Statista, Felix Richter, June 1, 2014; <https://www.statista.com/chart/1903/average-selling-price-of-android-and-ios-smartphones/>

⁸³ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 1b.

⁸⁴ Expert Report of Dr. Leonard, February 8, 2016, p. 27.



91. Nowhere else in the Leonard Report does Dr. Leonard analyze, evaluate, or discuss how the “diversion ratios” of 41 percent to 44 percent are derived. Without such an analysis and discussion, Dr. Leonard’s opinions and conclusions are unsubstantiated and therefore unreliable.⁸⁵

4.5.6 Dr. Leonard Substantially Understates “Android Profits” (see Leonard Ex. 1a.4)

92. Dr. Leonard’s “top-down” “Android Profits” approach begins in Leonard Exhibit 1a.4 – Profit Apportioned to Android Versus Search/Ads Technologies and Services – and continues to Leonard 3e – Top Down Apportionment. This approach results in “Android Profit” of [REDACTED] and “Android Profit (Apportioned to the 37 APIs)” of \$32.4 million.⁸⁶ Dr. Leonard’s “top-down” “Android Profits” approach is defective for several reasons including at least the following.

4.5.6.1 Dr. Leonard’s [REDACTED] TAC Savings Factor is Too Low

93. As illustrated in Leonard Exhibit 1a.4, Dr. Leonard utilized a cost-based metric of [REDACTED] to quantify the portion of Android Search Ad Revenue that Dr. Leonard asserts is attributable to the Android platform. The [REDACTED] figure is derived from financial data reflected in a May 2015 Google presentation entitled “Introduction to Android.”⁸⁷ Based on that financial information, Dr. Leonard concludes that Google earns [REDACTED] less profit for Search Ad Revenue generated from iPhones than it does from Search Ad Revenue generated from Android devices.⁸⁸
94. Dr. Leonard’s [REDACTED] figure is based on the difference between an imputed Search Ad Revenue-per-Android-unit figure of [REDACTED], and an imputed net margin from Search Ad Revenue-per-iPhone figure of [REDACTED]. The May 2015 Google presentation attributes the difference to the TAC Google pays to Apple Inc. to direct Internet traffic from iPhones and iPads to Google websites.⁸⁹ Dr. Leonard’s [REDACTED] TAC savings factor is too low.
95. On January 20, 2016, this Court entered an Order Re: Motion to Compel,⁹⁰ whereby Google was ordered to produce “charts specifying the following data for each provider of a non-Android mobile operating system with whom Google has or previously had a search distribution agreement for Google search services offered in connection with such non-Android mobile operating system, where such agreement also provided for the sharing of revenue.”⁹¹
96. In response to that Order, Google produced a document entitled “Google Search Distribution Agreements with Non-Android Mobile Operating System Partners” (“Google’s Non-Android

⁸⁵ Dr. Leonard’s iPhone Recapture Adjustment set forth in Leonard Exhibit 1b also suffers from some of the same defects I addressed above. Namely, Android-related TAC of [REDACTED] is too high, and the “Incremental Search and Advertising Expenses” are improperly allocated to the Android platform.

⁸⁶ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 3e.

⁸⁷ GOOG-00130338-386 at 343.

⁸⁸ Expert Report of Dr. Leonard, February 8, 2016, p. 33; [REDACTED]

⁸⁹ GOOG-00130338-386 at 343.

⁹⁰ Order Re: Motion to Compel, 3:10-cv-03561-WHA, Docket No. 1436, January 20, 2016, p. 2.

⁹¹ Order Re: Motion to Compel, 3:10-cv-03561-WHA, Docket No. 1436, January 20, 2016, p. 1.



Mobile O.S. Partner List”). For six Google non-Android Mobile O.S. Partners, this document provides: 1) the percentage of Search Revenue Google shares with the partner; 2) the total gross revenue earned by Google under the agreement; and 3) the Google search services which are the subject of the respective agreements.

97. Exhibit 7.6 is a calculation of the weighted average percent of Search Revenue Google shares with all six Partners reflected in Google’s Non-Android Mobile O.S. Partner List. As Exhibit 7.6 illustrates, since 2006, Google has paid back to its non-Android Mobile Operating System Partners [REDACTED] of the Search/Ad Revenue it earns from non-Android mobile devices of those partners.
98. Given the availability of the information in Google’s Non-Android Mobile O.S. Partner List, it is curious that Dr. Leonard chose to rely only on imputed profit margin figures reflected in one Google presentation that compares the annual profitability of Android devices to only iPhones as of a certain point in time (2015). In any event, the [REDACTED] factor derived by Dr. Leonard is about 3.6 percentage points lower than the average TAC percentages of Search Ad Revenue Google paid to non-Android Mobile O.S. Partners during the relevant time period.
99. Dr. Leonard’s application of his imputed [REDACTED] TAC savings to the [REDACTED] of Search Revenue Google earned from Android devices during the years 2008 to 2015 results in the understatement of the Android Search Ad Revenue attributable to the Android platform.

4.5.6.2 Google Would Not Have Realized 100% of AdSense/Display Revenue Absent Android

100. AdSense and Display revenues are generated from Android devices. However, Leonard Exhibit 1a.4 excludes revenue, TAC, and profit for the AdSense and Display Ad Revenue Google realized from Android devices. Presumably, it is Dr. Leonard’s position that no AdSense or Display revenue, TAC or profit is attributable to the Android platform, or conversely, that all AdSense and Display Ad Revenue, TAC and profit is attributable to Search Ads Technologies and Services. If this is, in fact, Dr. Leonard’s position, a necessary underlying assumption is that Google would have achieved 100 percent of the AdSense and Display Ad Revenues it realized through Android devices, regardless of whether or not the Android operating system was developed and commercialized. If this is Dr. Leonard’s position, it is undermined by several factors.
101. First, Google considered the risks that it faced of being locked out of other platforms, and considered those risks to be so material that it would undertake a long-term strategy of building its own platform. Google necessarily concluded either that the risk to achieving the revenue, or the risk of a dramatically increased cost of acquiring the revenue, was so high that a lengthy and expensive build-your-own approach was warranted. Even after it was faced with this lawsuit, Google’s President of Platforms and Mobile Media concluded that the risk to Google of missing



the “critical mobile window” was an existential one—stating that Google will be “out of business in 10 years” if it does not capture the mobile business.⁹²

102. This lockout/control issue applies to display advertising as well as other types. For example, modern web browsers have built-in capabilities, or add-on extensions, that allow for ad-blocking. The Safari “Reader View” is an ad-blocking capability.⁹³ Microsoft also has a built-in ad-suppression feature for its Edge web browser called “Reading View.”⁹⁴
103. In addition, I understand that AdSense and Display Ad Revenues are influenced by Android user data collected by Google. I understand that Google utilizes user data collected from Android devices to direct relevant AdSense and Display advertising to Android users and/or to direct users to Google and Google Network Partner websites. This results in increased Display and AdSense Ad Revenues. Absent this Android user data, Google would not achieve the same levels of AdSense and Display revenues and profits.
104. Third, without its own dominant position as a mobile platform provider, Google could not be assured of the same favorable terms for traffic acquisition on competitive platforms.
105. In Sections 4.2-4.4 above, I set forth the limitations of Dr. Leonard’s “iPhone Recapture Adjustment.” Those limitations undermine Dr. Leonard’s presumed assertion that some portion of the AdSense and Display Ad Revenue realized from Android devices would have been realized through iPhones in the absence of Android devices.
106. In addition to the limitations of Dr. Leonard’s “Diversion Ratio” theory, his presumed theory that the remaining (56 percent) portion of Android-generated AdSense and Display Ad Revenue would have been “diverted” to non-iPhone devices in the absence of Android lacks merit.

4.5.7 Dr. Leonard’s General & Administrative Expense Allocation is Improper

107. Like his “top-down” “Android-Related Profits” analysis contained in Leonard Exhibit 1a.1, Dr. Leonard’s “top-down” “Android Profits” analysis reflected in Leonard Exhibit 1a.4 improperly allocates “Android General and Administrative” expenses of [REDACTED] to the Android platform.⁹⁵ This allocation is improper for the same reasons set forth in Section 4.5 above.

4.6 Dr. Leonard’s Top-Down (“Lines of Code”) Apportionment Methodology is Unreliable

108. The “top-down” apportionment methodology reflected in the Leonard Report is purportedly based on the percentage of Android’s total lines of source code represented by the Infringed Java

⁹² GOOGLE-23-00000049.

⁹³ <http://fortune.com/2015/09/22/ad-block-ios-android/>.

⁹⁴ <http://www.engadget.com/2015/07/30/microsoft-edge-windows-10/>

⁹⁵ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 1a.1.



Copyrights. Such an apportionment methodology is invalid, and has been rejected by federal courts.⁹⁶ A straight “lines of code” allocation does not account for the *value* that the Java APIs offered to the platform. For example, according to the United States District Court for the Northern District of California in an unrelated matter, “[a]lthough A10 points to the ratio between the 145 lines of infringing code and the 10 million lines of code in Brocade's product, that ratio fails to account for the evidence suggesting the importance of the implementing code to Brocade's software.”⁹⁷

109. Apportionment is supposed to assign merit to the relative contribution between the infringing and noninfringing portions in generating the profits at issue. In other words, the apportionment methodology is supposed to be a reasonable approximation of the value contributed by the copyrighted material. Value takes into account many factors other than just lines of code.
110. Google's apportionment approach is invalid because the percentage of total lines of Android source code represented by the Infringed Java Copyrights is not indicative of the value of the Infringed Java Copyrights.
111. Moreover, according to the lines of code technical analysis performed by Oracle's expert Dr. Schmidt, a significant portion of the lines of code in Android include contributions from other third parties, blank lines, comments, and unspecified code authorship on which Google has not affixed a copyright notice.⁹⁸ Dr. Leonard's analysis implicitly assigns equal value to every single one of these lines of code. Evidence that demonstrates that the value of the Infringed Java Copyrights far exceeds that suggested by Dr. Leonard's apportionment methodology is discussed in the following subsections.

4.6.1 Android Does Not Work Without the Infringed Java Copyrights

112. I understand that the Android platform is critically dependent on the 37 Java APIs, both individually and collectively. According to Dr. Schmidt, the build process fails if the files from even one of the infringing 37 Java APIs are removed. As a result, Android will not run on a mobile device without all of the copied declaring code and the full set of files for the 37 Java APIs.⁹⁹ According to Dr. Schmidt, Android is not usable on a computing device, such as a phone or tablet, without each of the 37 Java APIs, or the copied declaring code in them.¹⁰⁰

⁹⁶ See, *Computer Associates Int'l, Inc. v. Altai, Inc.*, 775 F.Supp. 544, 571 - 572 (E.D.N.Y. 1991); *Brocade Communications Systems, Inc. v. A10 Networks, Inc.*, 2013 WL 831528 (N.D.Cal).

⁹⁷ *Brocade Communications Systems, Inc. v. A10 Networks, Inc.*, 2013 WL 831528 (N.D.Cal).

⁹⁸ Expert Report of Dr. Schmidt, February 29, 2016, Figures 1 and 2.

⁹⁹ Expert Report of Dr. Schmidt, January 8, 2016, ¶ 121.

¹⁰⁰ Expert Report of Dr. Schmidt, January 8, 2016, ¶ 78



113. Conversely, I understand that many of the other Android APIs could be removed from the Android source code without causing the build process to fail.¹⁰¹ This is because most of the other APIs are not part of the Android core library.¹⁰² The fact that the Android build process fails if any one of the 37 Java APIs is removed from the Android source code indicates that the Infringed Java Copyrights are relatively more valuable than other Android platform components including other Android APIs and other segments of the Android source code.

4.6.2 The Infringed Java Copyrights Provided Stability to the Android Core Library

114. As indicated in my Initial Report, Mr. Reto Meier, an Android developer advocate at Google since 2009, testified that Google copied the core Java APIs into Android instead of creating its own because “utilizing the same [Java APIs] would make it easier for folks to -- to use [Android] if they had experience with [the Java APIs].”¹⁰³ Bob Lee, head of Android’s core library team at Google, agreed in his deposition that the 37 APIs “are [the] good stuff from Java.”¹⁰⁴ Dan Bornstein, technical lead of Android’s Dalvik virtual machine and core libraries team at Google, agreed in his direct examination that, “absolutely,” his “determination of what packages would be implemented in the core library” was related to his “expectations of Java language programmers.”¹⁰⁵
115. According to Dr. Kemerer, the 37 Java APIs represent 73 percent of the stable Android core library.¹⁰⁶ According to Dr. Kemerer, the 37 Java APIs render the Android platform 82 percent more stable.¹⁰⁷ I also understand that 37 Java APIs stabilized around 10.9 years after the first release of the JDK whereas the Android Core APIs stabilized after only 2.3 years after the first release of Android.¹⁰⁸ Had the Android Core libraries taken 10.9 years to stabilize, Google would have missed the timing window to enter the mobile handset market when it did and would have been unable to launch the Android handset on time. Thus, the relative importance of the Android core library to the Android platform, and the significance of the Infringed Java Copyrights to the stability of the Android platform indicate that the Infringed Java Copyrights are more valuable than a value indicated by an approach based on a percentage-of-lines-of-source-code ratio, such as that utilized by Dr. Leonard.

4.6.3 The 37 Java APIs are Called Upon More Often by Popular Mobile Applications

¹⁰¹ Expert Report of Dr. Schmidt, February 29, 2016, ¶ 76.

¹⁰² See Section 6 below.

¹⁰³ Deposition of Reto Meier, December 11, 2015, p. 113.

¹⁰⁴ Deposition of Bob Lee, August 3, 2011, p48.

¹⁰⁵ Trial Testimony of Daniel Bornstein, Transcript Vol. 08, April 25, 2012, p. 1782.

¹⁰⁶ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 108.

¹⁰⁷ Expert Report of Dr. Kemerer, February 29, 2016, ¶ 27.

¹⁰⁸ Expert Report of Dr. Kemerer, February 29, 2016 ¶ 17.



116. According to Dr. Kemerer, an analysis was conducted to assess the relative importance of the 37 Java APIs in the Android App ecosystem from the perspective of App developers.¹⁰⁹ According to Dr. Kemerer, “the initial analysis empirically demonstrates the extent to which developers depend on the declarations provided by the infringed packages in the development of Android apps.”¹¹⁰
117. The analysis, as described in the Kemerer Report consisted of selecting the top 100 Apps for analysis.¹¹¹
118. Based on this analysis, Dr. Kemerer concluded that:

[T]he 37 Java APIs are a critical requirement for essentially every one of the 100 top applications. In fact, every one (100%) of the top 100 apps depends upon a minimum of three of the 37 copied Java API packages. The average number of dependencies is 11.5, or nearly a third of the 37 copied API packages. And one of the top 100 apps depends on 23 of the 37 copied API packages.¹¹²

If the analysis is restricted to the most popular of the 100 apps (the 14 apps that are listed as having between 1,000,000,000 and 5,000,000,000 downloads), they can be seen as being even more dependent upon the 37 copied API packages, with the minimum number of dependencies being eight, the average number 13.8, and the maximum number 17.¹¹³

119. This analysis indicates that application level dependencies on the 37 Java APIs are significant, and central to the Android app ecosystem and its developers.¹¹⁴
120. Dr. Leonard asserted that “most games, for example are written in C++ because of the performance benefits inherent in avoiding the use of the virtual machine.”¹¹⁵ I understand from Dr. Kemerer’s analysis of NDK Application Dependency, he found that contrary to Dr. Leonard’s assertions, very popular apps and games are heavily dependent on significant numbers of the 37 Java APIs. Some of the applications analyzed include Candy Crush, Instagram, Snapchat, Twitter and Angry Birds.¹¹⁶
121. Thus, it appears that Dr. Leonard’s assertions minimizing the importance of the 37 APIs to popular mobile applications is factually incorrect. Since the dependency on the 37 API is demonstrably significant, it is evident that the relative importance of the Infringed Java Copyrights

¹⁰⁹ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 126.

¹¹⁰ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 126.

¹¹¹ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 134.

¹¹² Expert Report of Dr. Kemerer, January 8, 2016, ¶ 135.

¹¹³ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 136.

¹¹⁴ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 140.

¹¹⁵ Expert Report of Dr. Leonard, February 8, 2016, ¶ 110.

¹¹⁶ Expert Report of Dr. Kemerer, February 29, 2016, Table 2: Dependence of Leonard-identified “NDK” Android apps on the 37 copied packages



to the Android app ecosystem and its developers indicates that the Infringed Java Copyrights are more valuable than the value indicated by an apportionment approach based on a percentage-of-lines-of-source-code ratio, such as the approach adopted by Dr. Leonard.

4.6.4 Google's Own Page Rank Score Demonstrates the Centrality of the 37 Java APIs

122. According to Dr. Kemerer, “centrality” is a metric that is used to describe the relative importance of a particular entity, or node, within a network of interconnected entities.¹¹⁷ According to Dr. Kemerer, “[a]pplying the notion of network centrality to the 37 Java API packages within the context of the Android source code as a whole is one way to understand how important those packages are to Android.”¹¹⁸ According to Dr. Kemerer, a high centrality score for the 37 Java APIs would indicate that the classes inside of them are connected to a high number of classes in packages outside of those packages. Such a pattern would indicate that the rest of the Android source code heavily depends on the 37 Java APIs.¹¹⁹
123. I understand that “PageRank” is a centrality measure that was developed by Larry Page and Sergey Brin as part of their research to develop a new search engine.¹²⁰ According to Dr. Kemerer, PageRank is now a widely referenced tool for network analysis, and is an appropriate metric for evaluating the centrality of the 37 Java APIs in the Android source code.¹²¹
124. A PageRank analysis was undertaken to identify the extent to which the Android source code leverages the functionality provided by the 37 Java APIs.¹²² The Android PageRank analysis produced a “PageRank score” for those classes which belong to the 37 Java APIs, as well as PageRank scores for the rest of the class groupings across the wider Android source code (i.e., the non-copied classes).¹²³
125. Figure 11 of the Kemerer Report compares the average PageRank score of the classes which belong to the 37 Java APIs to the average PageRank score of other classes within the Android source code (“non-copied classes”). According to Dr. Kemerer, Figure 11 to his report “very clearly demonstrates the vastly greater PageRank scores of copied classes, with the average copied class boasting a score that is over 30 times greater than that of the average non-copied class.”¹²⁴

¹¹⁷ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 141.

¹¹⁸ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 143.

¹¹⁹ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 144.

¹²⁰ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 146.

¹²¹ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 148.

¹²² Expert Report of Dr. Kemerer, January 8, 2016, ¶ 150. I understand that the Android software system network used in this analysis considers every single Java class from Version 5.1.0, release 1 (Lollipop) of the Android Open Source Project (AOSP) source code.

¹²³ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 152.

¹²⁴ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 153.



According to Dr. Kemerer, “[t]hese PageRank results show the importance of the 37 copied Java API packages to the network of the Android operating system.”¹²⁵

126. The relative importance of the Infringed Java Copyrights to the network of the Android operating system indicates that the Infringed Java Copyrights are more valuable than the value indicated by an apportionment approach based on a percentage-of-lines-of-source-code ratio, such as the approach adopted by Dr. Leonard.

4.6.5 The 37 Java APIs Enabled Google to Get Android to Market More Quickly

127. According to Dr. Kemerer, when Android was first created, Google benefited by leveraging the popularity and familiarity of the Java platform (including the Infringed Java Copyrights) among developers in order to quickly attract them to the Android platform.¹²⁶ I understand that developers are generally most familiar with declaring codes and SSO elements, and less familiar with the underlying implementing code.¹²⁷ Google’s use of the 37 Java APIs thus hastened the attraction of millions of developers’ familiarity with the Android platform and assisted in Google’s success in reaching and building a significant core of application developers.
128. Developers’ familiarity with the Java platform, including the 37 APIs, not only attracted developers to the Android platform, but also enhanced the developers’ productivity.¹²⁸ APIs allow for the faster, more efficient construction of high quality applications. Rather than engaging in the more laborious task of writing sequences of program code from scratch, developers were able to draw on the resources of the Java APIs, and use the packaged classes and methods to more easily create high quality programs.¹²⁹
129. By using the familiar Java APIs, Google both attracted more developers to the Android platform and made the work of those developers easier, thus further accelerating the development and acceptance of the Android platform.¹³⁰ Google needed to develop a mobile platform quickly to establish its presence in the market and to start the process of monetizing data from user engagement with applications and devices.¹³¹
130. Google was motivated to get to this market quickly before competing mobile platforms gained significant market share at Google’s expense, and before it lost the opportunity to dominate the

¹²⁵ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 153.

¹²⁶ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 64.

¹²⁷ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 76.

¹²⁸ Expert Report of Dr. Schmidt, January 8, 2016, ¶ 75.

¹²⁹ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 22.

¹³⁰ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 94.

¹³¹ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 66.



mobile platform so that it could generate revenue from advertising.¹³² The record evidence illustrating Google's motivation is substantial, and includes the following:

▪ *Sworn Testimony of Andrew Rubin:*

Q. And why did you want to accelerate your effort?

A. Why did I want to get to market faster?

Q. Yes.

A. Because I think it's a competitive advantage to come to market as quickly as possible.¹³³

...

Q. And what was the value of getting to market quickly to Google?

A. It gave us a competitive advantage.

Q. Against whom?

A. The existing incumbent platform manufacturers.

Q. Which were whom?

A. At the time, Microsoft, Symbian, RIM. Motorola had a couple of platforms.¹³⁴

...

Q. The deadline you were talking about, the December 2006 deadline, you said, "I was under incredible schedule pressure."

A. Yep.

Q. What did you mean by that?

A. Well, look, I mean, you have a window of opportunity in smartphones. I had competitors all over the place. When I started the company, Microsoft was my competitor. You know, there was Symbian in there as well, and, you know, all sorts of Linux initiatives. You have to ship as soon as feasibly possible.

I mean, you go to extraordinary length to ship sooner, because it's a very dynamic market. And it could shift directions at any time. Right. So my job as, you know, the architect of this business concept was to just do everything that I possibly could to get my solution to the market in the shortest time possible.¹³⁵

¹³² Dr. Schmidt Trial Testimony, April 24, 2012, 1456:15-19, 1457:19-25, 1458:1-16

¹³³ Deposition of Andrew Rubin, April 5, 2011, p. 38.

¹³⁴ Deposition of Andrew Rubin, April 5, 2011, p. 103.

¹³⁵ Deposition of Andrew Rubin, July 27, 2011, pp. 179-180.



▪ **Sworn Testimony of Eric Schmidt:**

Q. And one of the reasons that you were interested in having Android proceed as fast as it could was you wanted to beat Microsoft and Symbian to volume, correct?

A. Yes.

Q. And by beating Microsoft and Symbian to volume, you mean getting your handset out there with a lot of users before they had their handsets out there with a lot of user[sic]; is that fair?

*A. Yes. Volume means more users, so serving more customers.*¹³⁶

- **A July 24, 2006 Andrew Rubin Email:** indicates that Google was “in discussions for 8 months with Sun, walked away, and must prove that our internal effort is clean. Also, because we were in discussions for so long, we must acquire an existing implementation. We ship in 6 months!”¹³⁷
- **A January 2, 2006 Google Email:** from Brian Swetland indicates that the “[r]easons to shift to a primarily Java API . . . simplifies the application development story . . . reduces our development time . . . faster app development and debuggability.”¹³⁸
- **A 2006 Google Presentation:** describes the importance of leveraging Java developers and avoid the need to create a large developer services organization. According to the presentation, “[s]upporting Java is the best way to harness developers. Fact: Linux fragmentation threatens value. Tools and new app frameworks are biggest hurdles. 6M Java developers worldwide. Tools and documentation exist to support app development without the need to create a large developer services organization. There exist many legacy Java applications. The wireless industry has adopted Java, and the carriers require its support. Strategy: Leverage Java for its existing base of developers.”¹³⁹

4.7 Dr. Leonard’s Bottom-Up (Cost Based) Apportionment Methodology is Unreliable

131. According to Dr. Leonard, “I understand that a plaintiff can seek ‘unjust enrichment’ damages, which are any profits of the infringer that are attributable to the infringement and are not taken into account in computing the plaintiff’s actual damages.”¹⁴⁰ Dr. Leonard cites to 17 U.S.C. §504(b) in support of this statement.¹⁴¹ However, contrary to the opinion put forth by Dr. Leonard, “unjust enrichment” is not referenced in 17 U.S.C. §504(b) as a measure of monetary recovery for copyright infringement.

¹³⁶ Trial Testimony of Dr. Schmidt, April 24, 2012, p. 1458.

¹³⁷ Trial Exhibit 147, GOOGLE-01-00023889-890.

¹³⁸ Trial Exhibit 13, GOOGLE-01-00019511-513 at 513.

¹³⁹ GOOGLE-01-00025575-587 at 584.

¹⁴⁰ Expert Report of Dr. Leonard, February 8, 2016, pp. 7-8.

¹⁴¹ 17 U.S.C. §504(b).



132. 17 U.S.C. §504(b) specifically states as follows:

The copyright owner is entitled to recover the actual damages suffered by him or her as a result of the infringement, and any profits of the infringer that are attributable to the infringement and are not taken into account in computing the actual damages. In establishing the infringer's profits, the copyright owner is required to present proof only of the infringer's gross revenue, and the infringer is required to prove his or her deductible expenses and the elements of profit attributable to factors other than the copyrighted work.¹⁴²

133. As 17 U.S.C. §504(b) indicates, the measures of monetary recovery for copyright infringement include the actual damages suffered by the copyright owner “and any profits of the infringer that are attributable to the infringement and are not taken into account in computing the actual damages.”¹⁴³ Nowhere does the statute mention the concept of “unjust enrichment”.
134. The American Institute of Certified Public Accountants (“AICPA”) represents the CPA profession nationally regarding rule-making and standard setting. The AICPA develops professional standards and monitors and enforces compliance with the professional’s technical and ethical standards.¹⁴⁴ Technical Practice Aids are a source of various authoritative and non-authoritative or implementation guidance issued by the AICPA and other organizations. Technical Practice Aids include questions and answers issued by the AICPA on a variety of accounting, auditing and industry topics.¹⁴⁵
135. In 2013, the AICPA issued a Practice Aid entitled “Calculating Intellectual Property Infringement Damages” which sets forth the standards for calculating monetary recovery for copyright infringement. According to the AICPA:

17 USC 504 authorizes courts to grant copyright owners actual damages suffered as a result of the infringement. In addition, any profits of the infringer attributable to the infringement are granted to the copyright owner in order to remedy the damages caused by the infringement, as long as these damages are not duplicative. Should the copyright owner be unable to prove actual damages or the defendant's profits, 17 USC 504 alternatively grants the copyright owner the right to elect . . . to recover an award of statutory damages instead of actual damages and profits.¹⁴⁶

136. As seen above, the AICPA Practice Aid does not mention “unjust enrichment” in connection with copyright infringement. And furthermore, the only mention of “unjust enrichment” as a form of monetary recovery in the AICPA Practice Aid is with respect to monetary recovery for trade secret

¹⁴² 17 U.S.C. §504(b).

¹⁴³ 17 U.S.C. §504(b).

¹⁴⁴ <http://www.aicpa.org/about/missionandhistory/pages/missionhistory.aspx>

¹⁴⁵ <http://www.aicpa.org/publications/accountingauditing/techpractaids/pages/technicalpracticeaids.aspx>

¹⁴⁶ Forensic & Valuation Services Practice Aid – Calculating Intellectual Property Infringement Damages, AICPA, 2013, p. 20.



misappropriation.¹⁴⁷ The Uniform Trade Secrets Act specifically references “unjust enrichment” in its remedies provisions.¹⁴⁸ Thus, Dr. Leonard’s approach to calculating the measure of monetary recovery in this case is not only inconsistent with 17 U.S.C. §504(b), but it is also inconsistent with highly recognized standard setting organizations which provide guidance on its implementation.

137. With specific regard to Dr. Leonard’s opinions, the Leonard Report includes three “bottom-up” approaches which attempt to measure the “cost savings” enjoyed by Google as a result of its illegal use of the Infringed Java Copyrights. Avoided costs can be a measure of unjust enrichment (as can a head start benefit calculation), but it is not a measure of actual profit disgorgement. Avoided costs is a way of measuring a different benefit received by the defendant—the benefit of avoiding a cost that should have been paid for use of the intellectual property at issue. In this case, for example, such a benefit might be characterized by whatever license fee Google did not have to pay to Sun and Oracle for using the Infringed Java Copyrights. Here there was no such license and so the avoidance of that payment would be entirely hypothetical. It is my understanding that in copyright cases such hypothetical, or constructive licenses, are considered a form of actual damages to the plaintiff rather than profit disgorgement by the defendant. From a financial perspective, the hypothetical license is simultaneously lost revenue to the plaintiff and a cost foregone by the defendant. This has nothing to do with profits earned by the defendant because of infringement. My opening report sets forth no hypothetical license fee as part of Oracle’s claim for damages in this case.
138. In connection with preparing his three “bottom-up” approaches, Dr. Leonard analyzes a “counterfactual” (i.e. “but-for”) world and concludes that Google would have incurred certain costs had it not used the Infringed Java Copyright in connection with its development of Android. Although Dr. Leonard opines that “[t]he appropriate measure of the apportionment of Google’s Android-related profits to the alleged infringement using the bottom-up approach is the minimum among the three cost-savings and the profit loss,”¹⁴⁹ his cost savings metrics clearly do not reflect an apportionment of Google’s causally connected profits. Rather, they improperly reflect an unjust enrichment theory of damages. In the paragraphs that follow, I provide a further critique of the analytics and related assumptions underlying Dr. Leonard’s “bottom-up” approaches to apportionment.
139. Dr. Leonard’s use of cost savings to apportion Google’s causally connected profits related to infringing attributes of the Android Platform is unsupported by case law. Specifically, in his “bottom-up” apportionment, Dr. Leonard calculates the “generated cost savings for Google by allowing Google to avoid taking certain costly actions.”¹⁵⁰ I am unaware of any legal basis for using the cost savings associated with non-infringing alternatives for disgorgement, which I believe

¹⁴⁷ Forensic & Valuation Services Practice Aid – Calculating Intellectual Property Infringement Damages, AICPA, 2013, p. 22.

¹⁴⁸ http://www.uniformlaws.org/shared/docs/trade%20secrets/utsa_final_85.pdf, Section 3, Damages.

¹⁴⁹ Expert Report of Dr. Leonard, February 8, 2016, p. 94.

¹⁵⁰ Expert Report of Dr. Leonard, February 8, 2016, p. 84.



is the appropriate measure of recovery in this matter. In fact, I understand this Court has previously ruled against Google on this very issue:

In his damages report, Dr. Cox opined: 'The ready availability of obviously acceptable non-infringing alternatives also provide [sic] basis that the 'element of profit' that is attributable to the allegedly infringed API claim contained in the Android framework is very small or zero.

...

As Dr. Cox makes clear in his report, the existence of 'multiple acceptable and effective' non-infringing alternatives 'at little or no additional cost' greatly reduces the lost licenses fees (Cox Report 61). This order finds this aspect acceptable. Not acceptable, however, is allowing the existence of non-infringing alternatives to reduce recovery of wrongful profits. This is a distinct remedy for the purpose of disgorgement. Non-infringing alternatives have nothing to do with this.¹⁵¹

140. Akin to Dr. Cox, Dr. Leonard relies on a cost savings based analysis to reduce Oracle's recovery of Google's wrongful profits and determine the profit attributable to the Infringed Java Copyrights is very small.
141. What's more, each of the cost savings calculations Dr. Leonard relies on are fundamentally flawed and lack sufficient support. Dr. Leonard's cost saving scenarios are listed below, and my comments regarding each are provided in the sections that follow.
 - Costs associated with switching to OpenJDK
 - Costs associated with developer training in C/C++
 - Costs associated with paying third party developers to develop Android apps in C/C++¹⁵²

4.7.1 Avoidance of Costs Associated with Switching to Open JDK

142. Dr. Leonard states that the most appropriate measure of apportionment is the avoidance of costs associated with Google switching to OpenJDK, which he quantifies at \$85,000.¹⁵³ The Murray, Jaffe, and Schmidt Reports each provide ample evidence for why OpenJDK was not a viable economic or technical alternative for Google and the record evidence shows that Google rejected it because it wasn't a commercially viable alternative. Below I summarized what I believe to be the most notable defects in Dr. Leonard's analyses in the section below:
 - Dr. Leonard ignores the business and risk factors that Google and its OEMs and carriers would have considered.
 - Dr. Leonard disregards that OpenJDK was not an adequate alternative due to performance and compatibility issues.

¹⁵¹ Doc. 632 (Order Granting, in Part, Oracle's Motion to Exclude Portions of Leonard & Cox).

¹⁵² Expert Report of Dr. Leonard, February 8, 2016, pp. 84-88.

¹⁵³ Expert Report of Dr. Leonard, February 8, 2016, p. 87.



- Dr. Leonard ignores that Google intentionally rejected the use of OpenJDK.

4.7.1.1 Dr. Leonard Ignores the Business and Risk Factors that Android and its OEMs Would Have Considered

143. Google faced a limited window of opportunity to launch Android, and if Google missed that window, Android faced being locked out of the mobile market. In addition, the payouts to Andy Rubin and his team connected to the Android acquisition were contingent upon reaching Milestones which included developing a working phone and securing a relationship with a major carrier; otherwise all future earn-out payments would be forfeited. For at least these reasons, Google did not want its platform subject to a “viral” license such as GPLv2-CE (e.g. OpenJDK).
144. Commercial exploitation under the GPLv2 is impractical and Google acknowledged the significant risk that GPL-related licensing presented to partner adoption and thus time-to-market imperatives. Under OpenJDK, there was substantial risk that OEM and mobile carriers would be required to open-source their modifications to the Android platform under the relevant GPL license.¹⁵⁴ For this reason, most, if not all, commercial entities implementing Java for use in a device have declined OpenJDK and instead done so under a commercial license.
145. In a November 12, 2006 email, Andy Rubin proclaimed “GPL license (sun’s license doesn’t work for us.”¹⁵⁵
146. In an August 11, 2007 email to Bob Lee, Brian Swetland and Dan Bornstein, all Google/Android engineers, Andy Rubin discusses the challenges posed to OEMs and mobile carrier by using GPL in Android and why Google would want to distance itself from GPL licenses as much as possible:¹⁵⁶

... and as far as GPL-ing the VM, everything that is linked with the VM would get infected.

The problem with GPL in embedded systems is that it’s viral, and there is no way (for example) OEMs or Carriers to differentiate by adding proprietary works. We are building a platform where the entire purpose is to let people differentiate on top of it.

Finally, Sun has a different license for its library for SE and ME. The SE library is LGPL, ME library is GPL. That means anything that links with the ME library gets infected. And the SE library is not optimized for embedded systems.

Sun chose GPL for this exact reason so that companies would need to come back to them and take a direct license and pay royalties.

¹⁵⁴ Expert Report of Gwyn Murray; <http://arstechnica.com/uncategorized/2007/11/why-google-chose-the-apache-software-license-over-gplv2/>.

¹⁵⁵ Trial Exhibit 154 (GOOGLE-01-0002454 – 457); Deposition of Anwar Ghuloum, December 9, 2015, p. 35 – 36, Trial Exhibit 230.

¹⁵⁶ Trial Exhibit 230; Exhibit 3 to the Deposition of Andy Rubin, April 5, 2011, GOOGLE-02-00020474-475 at 474.



Tricky, no? Why would we want to do anything to support this behavior? We want to distance ourselves as much as possible from Sun.

-andy

147. During the same time frame, Google publicly expressed concern over what using OpenJDK for Android code would mean to its OEMs. In a report on the 2008 Google I/O conference, one observer explained:

The first and main reason they give us for using Harmony instead of OpenJDK is the GNU license (GPL). Cell phone makers want to link proprietary value-add code directly into the system (into JVM-based apps. and/or service processes), and they do not want to worry about copyleft. Perhaps there is some education needed here about the classpath exception. (I know I don't understand it; maybe they don't either. And their license wonks appear to have a well-considered preference for Apache 2 over GPL+CPE.)¹⁵⁷

148. In 2008, Andy Rubin confirmed that Google deliberately chose to release Android under the Apache license in order to avoid the risks that a GPL license might impose on OEMs. In an interview to CNET in 2008, he explained:

The thing that worries me about GPL is this: suppose Samsung wants to build a phone that's different in features and functionalities than (one from) LG. If everything on the phone was GPL, any applications or user interface enhancements that Samsung did, they would have to contribute back. At the application layer, GPL doesn't work.¹⁵⁸

149. Similarly, the Open Handset Alliance website explains that the reason for choosing the Apache License for Android is to enable handset manufacturers to keep their innovations and differentiated features as closed source, which could not have been accomplished using other licenses.

Apache is a commercial-friendly [sic] open source license. The Apache license allows manufacturers and mobile operators to innovate using the platform without the requirement to contribute those innovations back to the open source community. Because these innovations and differentiated features can be kept proprietary, manufacturers and mobile operators are protected from the "viral infection" problem often associated with other licenses¹⁵⁹

150. Potential commercial licensees have always expected that they only had limited options: (1) they could pay for a commercial license for Java, including the APIs, which required the implementation to pass the Java Compatibility Kit (JCK) tests (also referred to as the "TCK" for Technology Compatibility Kit tests); (2) they could create an independent implementation of the specification, under a different license, which also required that the implementation passed the TCK; or (3) they

¹⁵⁷ https://blogs.oracle.com/jrose/entry/with_android_and_dalvik_at.

¹⁵⁸ <http://www.cnet.com/news/why-oracle-not-sun-sued-google-over-java/>.

¹⁵⁹ http://www.openhandsetalliance.com/android_faq.html.



could take the GPLv2-CE license, which relieved them of compatibility requirements, but mandated that they would have to release their source code under the terms and conditions imposed by that license.

151. Except for Google and its development of Android, most, if not all, commercial entities implementing Java for use in a device have done so under a commercial license. Google required the prompt buy-in of OEMs and carriers to be able to successfully launch Android. The threat of having to open-source proprietary modifications under OpenJDK's GPLv2-CE would have put those partnerships at risk, undermined Google's ability to achieve early entry, and threatened the ultimate success of Android.¹⁶⁰

4.7.1.2 Dr. Leonard Neglects to Mention that Google Intentionally Rejected the Use of OpenJDK

152. Google intentionally *rejected* the use of GPLv2-based OpenJDK.¹⁶¹ If implementing OpenJDK for \$85,000 was a viable alternative, economic logic dictates that Google would have done so.¹⁶² Google faced known risks and made "enemies" using the Infringed Java Copyrights without a license. Therefore, it does not make sense for Google to have borne those risks and make those enemies, if they could easily have been avoided for \$85,000. Assuming Google seeks to maximize long-term profits, this suggests that OpenJDK was not, and has not been, an economically favorable choice for Google.
153. After bringing Android to market, Google acknowledged the looming lawsuit it would surely face because of its unauthorized copying of Java in Android. In August 2010, Mr. Lindholm wrote to Andy Rubin that Google's founders Larry Page and Sergey Brin had asked him "to investigate what technical alternatives exist to Java. . ." Lindholm added that his team had "been over a bunch of [alternatives to Java]" and that "they all suck." His conclusion was "that [Google] need[ed] to negotiate a license for Java . . ." ¹⁶³

4.7.2 Avoidance of Costs Associated with Developer Testing

154. Dr. Leonard's calculation of the \$2.3 million in avoided costs associated with training developers in C/C++ is incorrect for at least the following reasons, which I describe further in the sections that follow:
 - Dr. Leonard incorrectly conflates replacing the Java Community with replacing the Java language
 - Dr. Leonard exaggerates the utilization of NDK and provides no support for C/C++ as a reasonable alternative

¹⁶⁰ GOOGLE-02-00020474; Expert Report of Dr. Kemerer, February 8, 2016, ¶ 258.

¹⁶¹ Trial Exhibit 154.

¹⁶² <http://venturebeat.com/2015/12/29/google-confirms-next-android-version-wont-use-oracles-proprietary-java-apis/>.

¹⁶³ GOOGLE-12-10000022.



- Dr. Leonard greatly underestimates the full cost to replace Java-based apps in the Google Play store

4.7.2.1 Dr. Leonard Incorrectly Conflates Replacing the Java Community With Replacing the Java Language

155. By limiting his analysis to the costs associated with replacing the Java language contained in certain mobile apps, Dr. Leonard inherently mischaracterizes the use made of the Infringed Java Copyrights by Google. Google derived great value not only through the use of the Java platform, but more importantly through the poaching of the vast Java Community, that included OEMs, carriers and developers. [REDACTED]

[REDACTED]¹⁶⁴ [REDACTED]

[REDACTED]¹⁶⁵ [REDACTED]

[REDACTED]¹⁶⁶ In an e-mail from Andy Rubin to Larry Page on October 11, 2005, Mr. Rubin acknowledged that Java has advantages and that it was “the #1 choice for mobile development.”¹⁶⁷

156. A 2006 Sun presentation illustrates the widespread success of the Java Community that Google obtained through its use of the Infringed Java Copyrights, highlighting the platform’s ubiquity and potential for future growth among numerous markets.

¹⁶⁴ OAGOOGL3000000021-024.

¹⁶⁵ OAGOOGL3000000021-024; <http://www.prnewswire.com/news-releases/sun-strengthens-lead-in-worldwide-mobile-data-services-with-java-72506432.html>.

¹⁶⁶ OAGOOGL0004260166-187 at 167.

¹⁶⁷ GOOGLE-01-00019527.



Figure 6
Depiction of Java Community from Sun Presentation¹⁶⁸



157. Google faced a closing window of mobile opportunity to avoid being locked out. The Infringed Java Copyrights provided Google a powerful means of accessing dozens of OEMs and mobile carriers and millions of Java developers that Google desperately needed. Google's internal emails confirmed that the alternatives "all suck"¹⁶⁹ and Android needed access to Java and its developer community¹⁷⁰ and that the Infringed Java Copyrights would attract them to the Android platform.¹⁷¹

4.7.2.2 Dr. Leonard Exaggerates the Utilization of NDK and Provides no Support for C/C++ as a Reasonable Alternative

158. Dr. Leonard mischaracterizes Android NDK as a popular platform that accounts for at least half of Android app development. Android NDK is a toolset that allows a developer "to implement parts of your app using native-code languages such as C and C++."¹⁷² I understand that the NDK is not even encouraged as the Android developers guide states "[T]he NDK is not appropriate for most novice Android programmers, and has little value for many types of Android

¹⁶⁸ GOOGLE-01-00018140 at 143. Incidentally, the cover email dated January 31, 2006 of this document shows that Andy Rubin was in possession of this Sun presentation and indeed asked for the information continued therein.

¹⁶⁹ GOOGLE-12-10000022.

¹⁷⁰ Deposition of Daniel Bornstein, May 16, 2011, p. 47.

¹⁷¹ Deposition of Daniel Bornstein, May 16, 2011, pp. 47-49.

¹⁷² <http://developer.android.com/tools/sdk/ndk/index.html>.



apps. It is often not worth the additional complexity it inevitably brings to the development process.”¹⁷³ In fact, Google actually discourages developers from using NDK outside specific use cases such as game engines, signal processing and physics simulation. Google also states that “the NDK will not benefit most apps” and that using “native code on Android generally does not result in a noticeable performance improvement, but it always increases your app complexity. In general, you should only use the NDK if it is essential to your app – never because you prefer to program in C/C++.”¹⁷⁴

4.7.2.3 Dr. Leonard Greatly Underestimates the Full Cost to Replace Java-Based Apps in the Google Play Store

159. Dr. Leonard’s assumption that a \$715 course in a foreign programming language would be sufficient for a Java programmer to build and maintain Android’s most downloaded apps is nonsensical. An oversimplified yet not unreasonable analogy would be a unilingual student taking a single foreign language class, and then assuming the student would be able to create the best-selling works of that language. To develop large scale, complex, and highly used apps typically takes years.¹⁷⁵ Thus, minimizing the effort of learning C/C++ to a single course and cost of \$715, as Dr. Leonard has done, is not reasonable.
160. Dr. Leonard’s assumption that 3,000 developers would replace the collective contribution to the Android Platform of millions of Java developers is also not reasonable. In order to be competitive in the mobile market with companies such as Microsoft, Andy Rubin acknowledged the importance of leveraging “millions” of Java developers in order to meet the critical window of mobile opportunity.¹⁷⁶ To suggest that Android would achieve a similar outcome with a developer community of a few thousand is illogical.
161. In addition to relying on a flawed methodology and assumptions, Dr. Leonard’s actual calculation also appears to be flawed. He estimates that approximately 3,779 developers are responsible for the top 100 downloaded apps on Android for the years 2008 – 2015. After making adjustments for apps written using NDK and those on multiple platforms, he multiplies by 1.6 to account for the number of programmers per app developer. 1.6 programmers per app is likely a drastic understatement. To put this number into perspective, King Digital (recently acquired by Activision Blizzard), a developer of just four of the top 100 apps on Dr. Leonard’s list has 1,600 employees.¹⁷⁷ Many of those employees are developers, which was a key reason Activision acquired King, as they desired mobile expansion.¹⁷⁸ He derives the programmers per app ratio from the Google

¹⁷³ <http://developer.android.com/ndk/guides/index.html>.

¹⁷⁴ <http://developer.android.com/tools/sdk/ndk/index.html>.

¹⁷⁵ <http://www.coderanch.com/t/507541/java/java/long-good-Java>.

¹⁷⁶ Expert Report of Dr. Jaffe, February 8, 2016, ¶ 162.

¹⁷⁷ <https://www.macroaxis.com/invest/ratio/KING--Number-of-Employees>.

¹⁷⁸ <https://fortune.com/2015/11/03/activision-blizzard-king-digital/>.



Developer Challenge in 2008, in which only one of the applications from the Developer Challenge are among the highly rated applications that he listed in Exhibit 2i.¹⁷⁹

162. Finally, Dr. Leonard's analysis ignores that Android would need hundreds of thousands of apps available to be attractive to developers and consumers. By limiting his analysis to Java-enabled apps in the top 100, he fails to value the hundreds of thousands of other Java-enabled apps available on Google Play. Dr. Leonard is misguided to suggest that replacing the top few hundred apps would still enable Android to be competitive with platforms such as iOS, which today offer over a million apps.

4.7.3 Avoidance of Costs Associated with Paying Third Party Developers to Develop Android Apps

163. Dr. Leonard estimates the avoided costs associated with paying third party developers to develop the "most used" Android apps in C/C++ is \$23 million to \$100 million. His use of the cost approach and C/C++ as a reasonable alternative is improper for the reasons mentioned above as well as those listed below, which I describe further in the paragraphs that follow:
- Dr. Leonard's analysis is based on a marketing strategy that Google determined didn't work and wasn't considered to be an effective mechanism for app development
 - Dr. Leonard underestimates the full costs of developing a mobile app
 - Dr. Leonard only considers the cost of development for 1,000 apps and ignores the remaining 1.6 million apps currently offered by Google Play

4.7.3.1 Dr. Leonard's Analysis is Based on a Marketing Strategy that Google Determined Didn't Work and Wasn't Considered to be an Effective Mechanism for App Development

164. Dr. Leonard's analysis partly relies upon testimony from Reto Meier, Developer Relations employee at Google. Mr. Meier testified that Google considered financially incentivizing developers to build Android apps, but did not do it because it was not effective, particularly for big brands (e.g. developers of highly used apps). Specifically, Mr. Meier testified that Google elected not to undertake the plan because "it wasn't considered to be an effective mechanism for incentivizing app development."¹⁸⁰
165. An October 2010 email between Mr. Meier and several Developer Relations employees at Google explained that incentivizing third party app development was "the regular MO for both MS and Nokia" and that "Microsoft and Nokia are not only funding (and managing) the app development,

¹⁷⁹ Expert Report of Dr. Leonard, Exhibit 2i, "Free and Paid Apps Appearing on Daily Top 100 Download Lists, June 2015".

¹⁸⁰ Deposition of Reto Meier, December 11, 2015, p. 71.



they're also paying companies above and beyond development costs for the privilege" adding, however, that "such a strategy is not self-sustaining in the long term."¹⁸¹ In the same email chain, Mr. Meier compared incentivizing third party developers to "throw[ing] some money out the window and see if it comes to something."¹⁸²

4.7.3.2 Dr. Leonard Underestimates the Full Costs of Developing a Mobile App

166. In his testimony, Mr. Meier stated that such a program wasn't compelling to developers and ineffective because it "may have offsetted [sic] the initial upfront development costs, but the long-term, ongoing development maintenance and – support of a product would continue to cost additional resources for the company....there's significant risk that they wouldn't continue to develop, evolve, and ensure that it continued to be a high-quality app would have, in the longer term been a negative for the platform, and, additionally, the offset, in terms of ROI to developers, just wasn't that compelling...If we are talking about big brands, these aren't huge amounts of money, and their interest, from my recollection, was more of a longer-term ROI rather than an initial requirement to be able to offset the initial development."¹⁸³
167. Dr. Leonard ignores the long term costs required to develop and maintain a mobile app and instead basis his calculation only on estimated up front development costs of \$25,000 - \$100,000. Industry experts have indicated that up front development costs are only the "the tip of the iceberg".¹⁸⁴ A November 2014 Kinvey Report based on a survey of CIOs and Mobile Leaders found that mobile app development can be "costly, slow and frustrating" and that for development costs alone "...18 percent say they spend from \$500,000 to over \$1,000,000 per app, with an average of \$270,000 per app."¹⁸⁵ Furthermore, the Google presentation that Dr. Leonard relies upon specifies that up front development costs for games is \$500,000.¹⁸⁶ In 2014, mobile games accounted for approximately 90% of Android's app revenue, however, Dr. Leonard caps his cost-per-app range at \$100,000.¹⁸⁷
168. Dr. Leonard also incorrectly conflates the up front development cost for average mobile apps with that of the "most used apps". Highly used apps are likely to cost much more to develop and maintain than an average mobile app. The development of apps with millions of users requires the apps to be stable, robust, and tested for quality and failure under numerous test cases. I understand that in any coding process, time for debugging, testing, and ensuring quality usually takes much longer than simple code writing. There are numerous code processes and software quality initiatives that are required to ensure code works under a number of circumstances and test

¹⁸¹ Exhibit 5025 to the Deposition of Reto Meier, December 11, 2015, GOOGLE-37-00023782-785 at 783-784.

¹⁸² GOOGLE-37-00023782-785 at 782.

¹⁸³ Deposition of Reto Meier, December 11, 2015, p. 72.

¹⁸⁴ <http://www.formotus.com/14018/blog-mobility/figuring-the-costs-of-custom-mobile-business-app-development>.

¹⁸⁵ <http://www.formotus.com/14018/blog-mobility/figuring-the-costs-of-custom-mobile-business-app-development>.

¹⁸⁶ Exhibit 5024 to the Deposition of Reto Meier, December 11, 2015, GOOGLE-03-00007402 at 462.

¹⁸⁷ <http://www.androidauthority.com/app-annie-2015-app-retrospective-668731/>



conditions.¹⁸⁸ It would be unreasonable to suggest that the full costs associated with building and maintaining a highly used app are limited to \$25,000 - \$100,000.

4.7.3.3 Dr. Leonard Only Considers the Cost of Development for 1,000 Apps and Ignores the Remaining 1.6 Million Apps Currently Offered by Google Play

169. As with the previous analysis, Dr. Leonard assumes the other large portion of the 1.6 million apps that are Java-based and currently available on Google Play are irrelevant to Google's causally connected profit. By only quantifying the cost to develop 1,000 apps, Dr. Leonard neglects to value the cost to develop the additional hundreds of thousands of Java-based apps available for Android. To assume Android would be equally successful with only a thousand available apps completely ignores the impact of opportunity costs.
170. By applying Dr. Leonard's calculation to the total number of 1.6 million available apps in Google play, rather than the most used apps, approximately 560,000¹⁸⁹ Java-based apps would need to be developed in C/C++.¹⁹⁰ According to Dr. Leonard's average cost of development, that would cost Google \$14 billion to \$56 billion.

5. RESPONSE TO DR. LEONARD'S LOST PROFIT OPINIONS

171. As stated previously, in spite of the rebuttal opinions put forth in the Leonard Report, the opinions expressed in my Initial Report regarding Oracle's lost profits remain unchanged. In response to the opinions put forth by Dr. Leonard and as further support for the opinions reflected in my Initial Report, I note the following:

¹⁸⁸ <https://www.atlassian.com/landing/software-testing/>.

¹⁸⁹ Determined by using Dr. Leonard's estimate of 35% of Java based apps times 1.6 million available apps on Google Play.

¹⁹⁰ <http://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/>; Expert Report of Dr. Leonard, February 8, 2016, footnote 277. 1.6 million apps in Google Play store x 35% of Google Play apps that are non-Google apps, non-C++ apps, or apps not by multi-homing developers = 560,000.



- Dr. Leonard's zero lost profits opinion is unreasonable and inconsistent with the evidence
- Dr. Leonard's alternative lost profit opinions are speculative and unreliable
- Dr. Leonard inappropriately compares lost profits to Sun/Google negotiations
- Dr. Leonard improperly considers Java to be "stagnant"
- Dr. Leonard overstates the impact of the recession on the mobile industry
- Dr. Leonard fails to account for Sun's dominance among carriers and OEMs (for example) in the feature phone market
- Dr. Leonard fails to consider Sun's ability to transition its dominance into the smartphone market
- Dr. Leonard does not address Sun's relationship with Nokia

5.1 Dr. Leonard's Zero Lost Profits Opinion is Unreasonable and Inconsistent with the Evidence

172. Dr. Leonard opines that Oracle's lost profits are "zero" and that Google's infringement of the Java Copyrights did not result in the decline in Java ME revenue.¹⁹¹ However, Dr. Leonard's opinions fail to consider important facts and circumstances that render an opinion of zero lost profits unreasonable. The information presented in my Initial Report, and further detailed in this responsive report, provide strong support for my opinion that Google's infringement of the Java Copyrights caused Sun, now Oracle, to lose profits. Not only did Google's illegal use of the Infringed Java Copyrights negatively impact Sun and Oracle's ability to enforce and renew Java ME licenses, it also adversely impacted Sun's ability to capitalize on the emerging smartphone market.

173. To arrive at a zero lost profits opinion, Dr. Leonard ignores evidence that directly relates to lost Java ME license revenue as a result of Android.¹⁹² [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]¹⁹³ [REDACTED]
[REDACTED]
[REDACTED]¹⁹⁴ Similarly, Henrik Stahl testified:

[REDACTED]

[REDACTED]¹⁹⁵

¹⁹¹ Expert Report of Dr. Leonard, February 8, 2016, p. 11.

¹⁹² OAGOOGL0000799926.

¹⁹³ OAGOOGL0000799926.

¹⁹⁴ OAGOOGL0000457616-617 at 617.

¹⁹⁵ Deposition of Henrik Stahl, January 14, 2016, pp. 162-164.



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174. In an attempt to discredit my Java ME lost profits analysis and thus provide support for his zero lost profits opinion, Dr. Leonard improperly suggests that my lost profits opinion is overstated because the losses per Android device profit is higher in earlier years than it is in later years.¹⁹⁷ This opinion is fundamentally flawed as it suggests Sun's losses in the early years would immediately tie to phone sales. Once Android was chosen by OEM's/carriers there would be a delay as to when the Android phones would enter the market. Dr. Leonard's per-unit calculation also inappropriately suggests that the relationship between Android units and lost Java ME profits should be linear throughout the entire damages period. However, Android does not have a static relationship with Java ME whereby a unit of Android on the market causes a specific level of Java ME lost profits. Sun lost entire business relationships, it lost the opportunity to compete in the smartphone space, and it lost the ability to significantly monetize Java through its historic licensing model.
175. Dr. Leonard also incorrectly argues that a decline in the amount of Java ME revenue per feature phone suggests that Android did not cause Java ME lost profits.¹⁹⁸ He reasons that, since Oracle was unable to earn consistent Java ME revenue per feature phone, a decline in Java ME could not be the result of Google's infringement because Android does not compete with feature phones.¹⁹⁹ First, Android does in fact compete with feature phones.²⁰⁰ Even if Android were used predominantly on smartphones, it is incorrect to assume that it does not compete with other mobile devices, as Dr. Leonard suggests. Rather Android entered the market and gained rapid success precisely because it was able to successfully and effectively compete with existing technology on the market, including feature phones. Furthermore, feature phones and smartphones are not entirely distinct from one another as the functionality exists on a continuum, and feature phones continue to dominate the international mobile device market.²⁰¹ Dr. Leonard's opinions in this regard are further flawed, given my understanding that Android has been used on feature phones.²⁰² Dr. Leonard also ignores Sun's attempts to transition from feature phones to smartphones as evidenced by its acquisition of SavaJe in 2007.²⁰³

¹⁹⁶ Deposition of Henrik Stahl, January 14, 2016, pp. 162-164.

¹⁹⁷ Expert Report of Dr. Leonard, February 8, 2016, p. 136. Exhibits 4a and 4b to the Expert Report of Dr. Leonard, February 8, 2016.

¹⁹⁸ Expert Report of Dr. Leonard, February 8, 2016, p. 136-137.

¹⁹⁹ Expert Report of Dr. Leonard, February 8, 2016, p. 136-137.

²⁰⁰ <http://www.cnet.com/news/android-and-the-future-of-feature-phones/>.

²⁰¹ <http://www.philstar.com:8080/telecoms/2013/04/06/927330/asha-blurring-lines-between-feature-phones-smartphones>; <http://qz.com/418769/theres-still-plenty-of-money-in-dumb-phones/>.

²⁰² <http://www.cnet.com/news/android-and-the-future-of-feature-phones/>.

²⁰³ OAGOOGL00006231006-033 at 025; OAGOOGL0000473609-612; OAGOOGL0000424812-813 at 812.

EXHIBIT G
PART 3 OF 6

**REDACTED VERSION OF
DOCUMENT SOUGHT TO BE
SEALED**



5.2 Dr. Leonard's Alternative Lost Profits Opinions Are Speculative and Unreliable

178. Despite claiming Oracle's lost profits are zero, Dr. Leonard puts forth two alternative Java ME lost profit calculations.²⁰⁹ My comments regarding Dr. Leonard's alternative calculations are detailed throughout this section, and can be summarized as follows:
- The underlying basis for Dr. Leonard's calculation is improper
 - Dr. Leonard's reconstructed market is speculative
 - Dr. Leonard's conversion of market share to "revenue capture" is misleading
 - Dr. Leonard's diversion ratio is unfounded and misleading
179. Dr. Leonard states he "adjusted Mr. Malackowski's calculation by starting with Oracle's actual Java ME licensing revenues, and asking what effect Android had on those revenues under conservative assumptions..."²¹⁰ However, Dr. Leonard does not "adjust" my analysis. Rather, he performs an entirely different analysis that suffers from several deficiencies.
180. First, Dr. Leonard's starting point of Oracle's actual Java ME licensing revenues is inappropriate because the revenues he relies on are already reduced due to Google's illegal use of the Infringed Java Copyrights. Thus, by basing his alternative lost profit calculations on an already reduced revenue stream, Dr. Leonard's analysis significantly understates Sun's losses.
181. Next, Dr. Leonard calculates the "potential Java ME licensed handsets" by creating a "but-for" market whereby Sun's market share is recalculated to incorporate infringing units absent infringement. Such an approach – typically referred to as a "Mor-Flo" analysis in connection with patent infringement actions – is inappropriate in this copyright infringement matter as it requires recreating an emerging smartphone market, absent Google's infringement. Given the transformation of the mobile industry throughout the damages period, any attempt to recreate the market absent Android's infringement would be highly speculative. In fact, since Android was released at the same time as the smartphone shift, there does not exist an accurate representation of the smartphone market absent Android's infringing impacts.
182. Dr. Leonard next deducts Android units to arrive at "non-Android handsets," before reducing that amount by the number of iPhone units to arrive at "Potential Java ME Licensed Handsets".²¹¹ Without expressly saying so, by removing iPhone units Dr. Leonard's analysis implicitly assumes iOS would be the only economic substitute for Android through 2015. Such an assumption fails to consider the potential that an additional competitor such as RIM, Nokia, Microsoft and/or Sun could have emerged in Android's absence. This speculative assumption runs contrary to factual evidence showing RIM, Nokia, Microsoft and Sun as market leaders prior to the introduction of Android. It is also improperly suggesting that numerous third parties that are now associated with

²⁰⁹ Expert Report of Dr. Leonard, February 8, 2016, pp. 139-140.

²¹⁰ Expert Report of Dr. Leonard, February 8, 2016, p. 139.

²¹¹ Exhibit 4f to the Expert Report of Dr. Leonard, February 8, 2016.



Android (e.g. OEMs, app developers, etc.) would not have been ready, willing and able to align with a (non-Android) provider of a non-iOS mobile platform.

183. In addition to these flaws in Dr. Leonard's "potential Java ME licensed handsets" calculations, reviewing the next steps in his lost profits analysis reveals additional flaws. Dr. Leonard subsequently uses the previously discussed calculations to determine the "Potential Java ME Market Share" by dividing the "Potential Java ME Licensed Handsets" (which improperly exclude iPhone units as discussed previously) by "Non-Android Handsets".²¹² Rather than using Sun's actual market share and extrapolating the additional units it would have captured in the "but-for" world as is typically done in Mor-Flo analyses, Dr. Leonard improperly recalculates an alternative market share. In doing so, Dr. Leonard ignores the possibility that Sun could have maintained its market dominance, [REDACTED]

²¹³

184. Next, Dr. Leonard determines a "but-for Java ME Revenue Capture Rate" by multiplying the "Potential Java ME Market Share" by "Android Handsets" and dividing the product by the "Potential Java ME Licensed Handsets".²¹⁴ This calculation is not a revenue capture rate, despite Dr. Leonard calling it that. In fact, this is the additional unit market share of what Dr. Leonard believes are the total possible Java ME units. Applying this unit market share increase to Java's damaged actual revenues, is meaningless, because they do not represent or reflect that value of total possible Java ME units. Therefore, he has misapplied his so called "revenue capture rate" to an inappropriate revenue stream rendering the results meaningless.
185. I note, Dr. Leonard does not alter my approach to incremental expenses. In fact, he does not discuss incremental expenses aside from deducting them in his lost profits calculations. The calculations described above result in Dr. Leonard's opinion that Java ME lost profits equal \$128.5 million²¹⁵
186. In addition to his \$128.5 million lost profits analysis, Dr. Leonard offers a second alternative calculation of Java ME lost profits. This second approach begins with the same methodology as his first alternative, but Dr. Leonard performs an additional iPhone based adjustment to the "but-for" market based on what he refers to as a "diversion ratio." The result of Dr. Leonard's second alternative calculation is \$85.7 million,²¹⁶ and my comments regarding the "diversion ratio" upon which Dr. Leonard has inappropriately relied to perform his second alternative calculation are detailed in Sections 4.2-.4.4 of this report.

²¹² Exhibit 4f to the Expert Report of Dr. Leonard, February 8, 2016.

²¹³ Exhibit 1390 to Deposition of Alan Brenner, OAGOOGL0013561757-786 at 759.

²¹⁴ Exhibit 4f to the Expert Report of Dr. Leonard, February 8, 2016.

²¹⁵ Expert Report of Dr. Leonard, February 8, 2016, p. 140; Exhibit 4e and 4f to the Expert Report of Dr. Leonard, February 8, 2016.

²¹⁶ Expert Report of Dr. Leonard, February 8, 2016, p. 140.



5.3 Dr. Leonard Improperly Compares Lost Profits to Sun/Google Negotiations

187. Dr. Leonard inappropriately states his alternative lost profit calculations are “more consistent with both Sun’s initial proposal to Google, and the parties’ final negotiating positions, during the Sun-Google negotiations in 2005 and 2006 regarding a possible collaboration between the two companies to develop a Java-language based mobile platform”.²¹⁷ Using offers made in an unsuccessful negotiation to support a lost profits opinion is inappropriate. A major aspect of the negotiations was Sun’s insistence that Google use a compliant version of Java such that Sun would be able to continue to expand and grow its Java business. Thus, a major reason the negotiations failed is because the parties could not agree on this issue, or on the appropriate level of compensation for a Google intended non-compliant use of Java.

5.4 Java Was Not Stagnant When Google Chose to Adopt it for Use with Android and it is Not Stagnant Now

188. Dr. Leonard claims Java was stagnant prior to the introduction of Android and that Java ME revenue declined as a result of this ongoing problem, and not due to Google’s infringement of the Java Copyrights. However, Dr. Leonard’s opinion ignores that, at the time of Google’s first infringement of the Java Copyrights, Java was the leading applications platform and its developer community was continuing to grow. [REDACTED]
[REDACTED]²¹⁸ As discussed in my Initial Report, in 2006 there were six million Java developers and by 2010 the Java development community had grown to nine million members.²¹⁹ [REDACTED]
[REDACTED]²²⁰ [REDACTED]
[REDACTED]²²¹ Had Java been “stagnant,” as Dr. Leonard alleges, it is unlikely that the number of Java developers and Java enabled phones would have grown by such amounts over those time periods. Furthermore, as seen in the following Figure 7, over the period 2002 – 2016, Java’s developer community rating has consistently remained ahead of most, if not all, of its competition.

²¹⁷ Expert Report of Dr. Leonard, February 8, 2016, p. 141.

²¹⁸ Deposition of Alan Brenner, December 15, 2015, pp. 75-76.

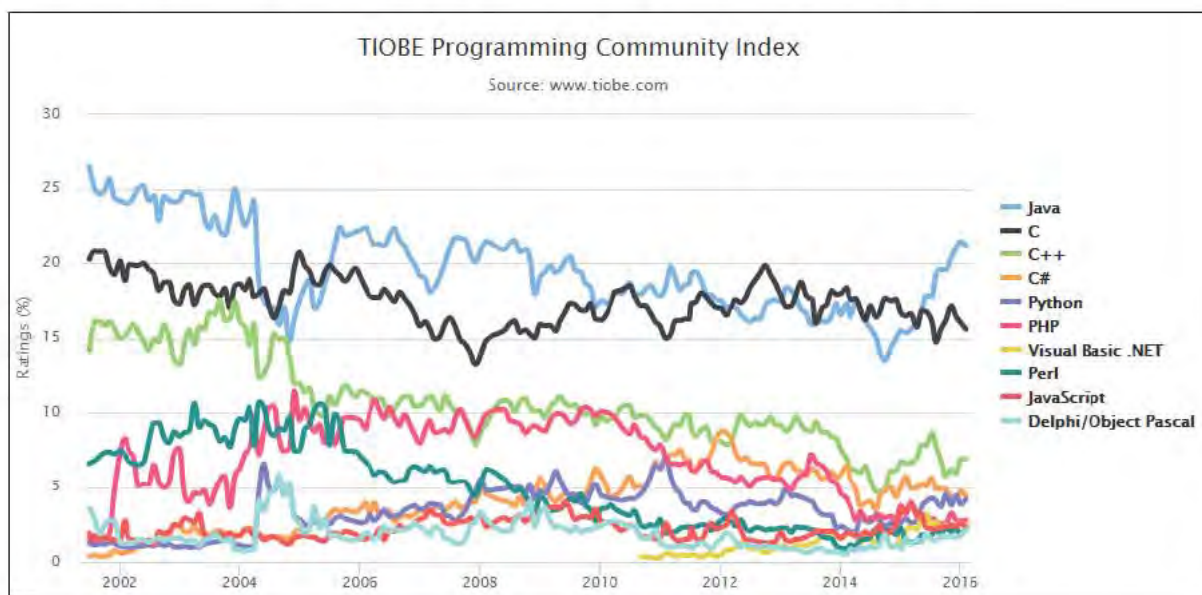
²¹⁹ OAGOOGL0013122655-718 at 656.

²²⁰ OAGOOGL0000061924-2030 at 1954.

²²¹ OAGOOGL0013122655-718 at 662.



Figure 7
Historical Summary of Java Programming Community Ratings ²²²



189. Google's use of Java in Android further supports an assertion that Java ME revenue did not decline due to lack of Java viability for a mobile platform. In a January 2006 internal Google email chain, Mr. Brian Swetland stated: "Java is more accessible than C++. There are more Java programmers. There is more standardization in tools and libraries. Debugging is much simpler."²²³ Additionally, Mr. Rubin stated in an email in April 2006 that: "We will ship a more stable product sooner if we do as much as possible in Java."²²⁴ In a March 2006 Google Monetization Proposal to Sun, Google states "Our goal is to create a branded open handset platform which has an implied conformant level of functionality and APIs...Sun could play a significant role in that conformance and branding process."²²⁵ Similarly, in a November 2006 Google presentation to T-Mobile regarding its wireless partnership, Google stated: "Supporting Java [ME] is the best way to harness developers...Linux fragmentation threatens market acceptance. Tools and new app frameworks are biggest hurdles. 6M Java developers worldwide. Tools and documentation exist to support app development without the need to create a large developer services organization. There exist many legacy Java applications. The wireless industry has adopted Java, and the carriers require its support."²²⁶

²²² <http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html>

²²³ GOOGLE-01-00019511-513 at 512.

²²⁴ GOOGLE-01-00075935-936 at 935.

²²⁵ Trial Exhibit 11, p. 4.

²²⁶ Trial Exhibit 387, p. 40

191. Dr. Leonard also improperly argues Sun's licensing practices caused "the Java Platform to be fragmented"²³⁰, however this assertion disregards Sun's attempts to maintain control of Java and the continued success of the platform. Dr. Leonard improperly states that Sun's TCK left room for incompatibility, when in fact part of the reason for implementing the TCK was to reduce fragmentation.²³¹ Dr. Leonard also asserts Sun's license with DoCoMo "is a good example of how it created fragmentation"²³² however his only citation for this argument is a reference to a conversation with John Rizzo. Thus Dr. Leonard inappropriately makes this assertion without even citing the actual license agreement, or any other evidence in this matter. [REDACTED]

233

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192. Dr. Leonard opines that the financial crisis of 2008 “was a cause of the failure of JavaFX Mobile as well as a decline in Sun’s revenues generally, likely was another contributory factor to the decrease in Java ME licensing revenues that had nothing to do with Android.”²³⁵ To support this opinion, Dr. Leonard looks to Sun’s Systems Group, (which consists of “Server Products” and “Storage Products” and Java licensing revenues) which experienced a decrease in revenue of -1.7% in FY 2008 and -22.2% in FY 2009.²³⁶ However, Dr. Leonard does not link the declining Systems Group revenue directly to Java ME beyond simply noting that Java ME is reported under Sun’s Systems

²³⁶ Expert Report of Dr. Leonard, February 8, 2016, p. 124.



Group. Comparing Java ME revenue to the total revenue for the Systems Group reported in the annual report, Dr. Leonard indicates that Java ME revenue represented █% of Sun's Systems Group in 2008 and █% in 2009.²³⁷ As evidenced by these calculations, Java ME is a small portion of the Systems Group and thus the overall Systems Group financial performance is not representative of Java ME specifically. Furthermore, in its 2009 Form 10-K, Sun attributed the decline in its Systems Group to "the weakness in demand for high-end servers" and "aggressive discounting with respect to our tape and enterprise disc array products."²³⁸

193. Although certain aspects of Sun's business declined as a result of the recession, it should be noted that a material portion of Sun's revenue was generated through the sale of servers, primarily to large financial institutions. In 2009, more than 25% of Sun's overall revenue resulted from the sale of servers²³⁹ and, because many large financial institutions were negatively impacted by the financial crisis, Sun's sales of servers declined rapidly.²⁴⁰ As a result of the financial crisis, Sun re-organized its software business group in addition to cutting costs in hopes of improving its profit margins.²⁴¹ Notably, Sun's 2009 Form 10-K also describes the introduction of the JavaFX Mobile Platform as one of the "cornerstones of [our] business strategy."²⁴²
194. While the financial crisis significantly impacted the economy, consumers' growing use of mobile data on increasingly complex mobile devices set the stage for the mobile industry, and Sun's related business, to minimize the impact of the recession. This is reflected in the following excerpts taken from analyst reports:
 - The Economist stated: *"Despite the recession, the mobile industry is enjoying a promising transformation."*²⁴³
 - Infonetics Research stated: *Bucking the general trend, smartphones are expected to out-perform the downturn and show modest growth in 2009, and will be the only mobile phone segment to maintain annual revenue growth over the next five years, and the only to post double-digit annual revenue growth from 2011 to 2013."*²⁴⁴

²³⁷ OAGOOGL0100167800; Sun Microsystems, 2009 Annual Report, June 30, 2009, p. 90.

²³⁸ Sun Microsystems, 2009 Annual Report, June 30, 2009, p. 48.

²³⁹ <http://www.sec.gov/Archives/edgar/data/709519/000119312509183969/dex992.htm>;
<http://www.nytimes.com/2008/10/31/technology/companies/31sun.html>.

²⁴⁰ http://www.forbes.com/2008/10/20/sun-earnings-loss-tech-enter-cx_ag_1020sun.html;
<http://www.eweek.com/c/a/IT-Infrastructure/Sun-Microsystems-Fujitsu-Rolling-out-New-SPARCbased-Server-System>;
<http://www.cnbc.com/id/32653203>;
http://www.nbcnews.com/id/27716152/ns/business-us_business/t/sun-microsystems-cut-workers/#.VqVrH_krLIU.

²⁴¹ http://www.nbcnews.com/id/27716152/ns/business-us_business/t/sun-microsystems-cut-workers/#.VqVrH_krLIU.

²⁴² Sun Microsystems, 2009 Annual Report, June 30, 2009, p. 6.

²⁴³ "Boom in the Bust," March 5, 2009, www.economist.com/node/13234981.

²⁴⁴ "Smartphone sales buck the recession," March 26, 2009, Infonetics Research, <http://www.infonetics.com/pr/2009/2h08-mobile-wifi-phones-market-research-highlights.asp>



- Online research company Mobile Marketer, a self-proclaimed news leader in mobile marketing, media and commerce stated: *"While the failing economy has started to hit hard on the wireless data ecosystem, especially the infrastructure and handsets segments, consumers haven't really pulled back on mobile data spending overall, just yet."*²⁴⁵

195. As further evidence of the contrary nature of the mobile industry, the number of mobile device internet users grew 37.4 percent from 2011 to 2012.²⁴⁶ Furthermore, as seen in the following Figure, the number of mobile connections continued to increase throughout the duration of the recession.

Figure 8

Historical Summary of Mobile Connections by Region ²⁴⁷



196. Along with the growing number of internet capable devices and mobile connections, the corresponding number of data subscribers grew during the same time period. Despite the effects of the recession on consumer spending, from 2008 to 2014, the number of mobile data subscribers grew at a compound annual growth rate of 7.6 percent and "data access including flat rate data plan subscriptions has also shown significant strength."²⁴⁸ [REDACTED]

[REDACTED]²⁴⁹

²⁴⁵ "Is Recession Positively Impacting the Wireless Industry," March 3, 2009, www.mobilemarketer.com.

²⁴⁶ "Smartphone Users Worldwide Will Total 1.75 Billion in 2014," January 16, 2014, www.emarketer.com.

²⁴⁷ "The Mobile Economy," 2015, GSMA, www.gsma.com.

²⁴⁸ "The Mobile Economy," 2015, GSMA, www.gsma.com; "Is Recession Positively Impacting the Wireless Industry," March 3, 2009, <http://www.mobilemarketer.com/cms/news/research/2748.print>.

²⁴⁹ OAGOOGL0000491596-643 at 610.



Figure 9

Growth in Mobile Data Usage During the 2008 – 2009 Time Period ²⁵⁰



197. In response to increases in mobile connectivity, developers were actively providing content and services to the expanding user base. As discussed previously, the number of Java developers increased to nine million in 2010 from six million in 2007 and the number of Java enabled phones grew from 2.6 billion in 2009 to over 3 billion in 2010. This growth occurred throughout the recession.

198. At the time of the recession, Sun was more concerned about the impact of Android than the impact of the declining economic environment. [REDACTED]

[REDACTED]

[REDACTED] ²⁵¹ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] ²⁵² [REDACTED]

[REDACTED]

[REDACTED] ²⁵³

²⁵⁰ OAGOOGL0000491596-643 at 610.

²⁵¹ OAGOOGL0000401814-817 at 816.

²⁵² OAGOOGL0000401814-817 at 816.

²⁵³ OAGOOGL0000725014.



199. Finally, I note that, following Oracle’s acquisition of Sun, which was announced 2009 and closed in 2010, Mr. Larry Ellison confirmed the value of Java, despite the ongoing financial crisis, when he stated Java is “the single most important software asset we have ever acquired.”²⁵⁴

5.6 Sun’s Dominance of the Feature Phone Market

200. The decline in Java ME licensing revenue was not a result of the increase in smartphones, as Dr. Leonard suggests. At the time of Google’s first infringement, feature phones dominated the international market and Java was enabled on the majority of such devices. Additionally, there was not a specific distinction between feature and smart phones, [REDACTED]

201. And Java ME licenses specified “mobile devices” as fields of use and did not distinguish between feature phones and smart phones. [REDACTED]

²⁵⁴ “‘Oracle Snatches Sun, Foiling IBM,’ April 21, 2009, The Wall Street Journal,” <http://www.wsj.com/articles/SB124022726514434703>.

²⁵⁵ Deposition of Alan Brenner, December 15, 2015, pp. 67-68.

²⁵⁶ OAGOOGL2000181111 at 136.



202. [REDACTED]
203. [REDACTED] As late as July 23, 2013:

*The biggest opportunity right now isn't in smartphones, where users are bombarded by the fruits of and ever more competitive market for apps and mobile services. Rather, the play for some companies, especially any that wish to expand into emerging markets, is on the 'dumbphones' – aka non smartphones, or in industry parlance, feature phones – that most people in rich countries have now left behind.*²⁶⁰

204. Facebook's actions in 2013 were also consistent with strong demand for feature phones. This is evidenced by its Facebook for Every Phone program which “allows people with data plans on their feature phones to have smartphone-like experiences while using Facebook – meaning they get images, updates, chat, the whole thing.”²⁶¹
205. Even if the shift to smartphones had an impact on Java ME, the shift was accelerated through Google's release of Android. Google's infringement and release of Android for free accelerated the move of Java's customers to smartphones and have had a detrimental impact on Oracle's business. Dr. Leonard ignores that the very circumstances he points to were often caused by Google's infringement.

²⁵⁷ “Why did everyone abandon the feature phone market?” April 1, 2014, Emerging UX, <http://emergingux.com/why-did-everyone-abandon-the-feature-phone-market/>.

²⁵⁸ “The biggest opportunity in mobile right now isn't on smartphones,” July 23, 2013, Quartz, <http://qz.com/106979/the-biggest-opportunity-in-mobile-right-now-isnt-on-smartphones/>.

²⁵⁹ Deposition of Alan Brenner, December 15, 2015, pp. 150-152.

²⁶⁰ “The biggest opportunity in mobile right now isn't on smartphones,” July 23, 2013, Quartz, <http://qz.com/106979/the-biggest-opportunity-in-mobile-right-now-isnt-on-smartphones/>.

²⁶¹ “The biggest opportunity in mobile right now isn't on smartphones,” July 23, 2013, Quartz, <http://qz.com/106979/the-biggest-opportunity-in-mobile-right-now-isnt-on-smartphones/>.



5.7 Sun's Ability to Transition Into the Smartphone Market

206. Dr. Leonard wrongly asserts that Sun's smartphone operating system plans were terminated prior to the launch of Android and thus Android did not cause lost profits.²⁶² Dr. Leonard's opinion that Oracle's failure to build a smartphone operating system is due to factors other than Android overlooks the impact that Android had on Oracle's decision not to continue with Sun's plans to develop a smartphone operating system.²⁶³ For example, Larry Ellison testified [REDACTED]
[REDACTED]
[REDACTED]
207. Aside from Java's feature phone market dominance, certain smartphones were also Java-enabled. For example, Sun licensed the Java platform for use in all Blackberry smartphones and the Nokia Communicator and Series 60 devices, which were not only considered smartphones but, at the time, were some of (if not the) most advanced devices on the market. [REDACTED]
[REDACTED]
[REDACTED]²⁶⁵ [REDACTED]
[REDACTED].²⁶⁶
208. As seen in the following Figure, shipments of smartphones first exceed feature phones in 2015, almost 10 years after Google's first use of the Infringed Java Copyrights. This shift was in part due to Google's Android, as it provided a lower cost option to the smartphone market: "The surge in new smartphone users will also create a stage where cheap phones using Firefox OS could begin to gain a foothold in South America, with the vast majority of the rest upgrading from feature phones in developing countries expected to buy an Android phone."²⁶⁷

²⁶² Expert Report of Dr. Leonard, February 8, 2016, p. 130; OAGOOGL0007622843-845 at 843.

²⁶³ Expert Report of Dr. Leonard, February 8, 2016, p. 132.

²⁶⁴ Deposition of Larry Ellison, August 12, 2011, pp. 63-64.

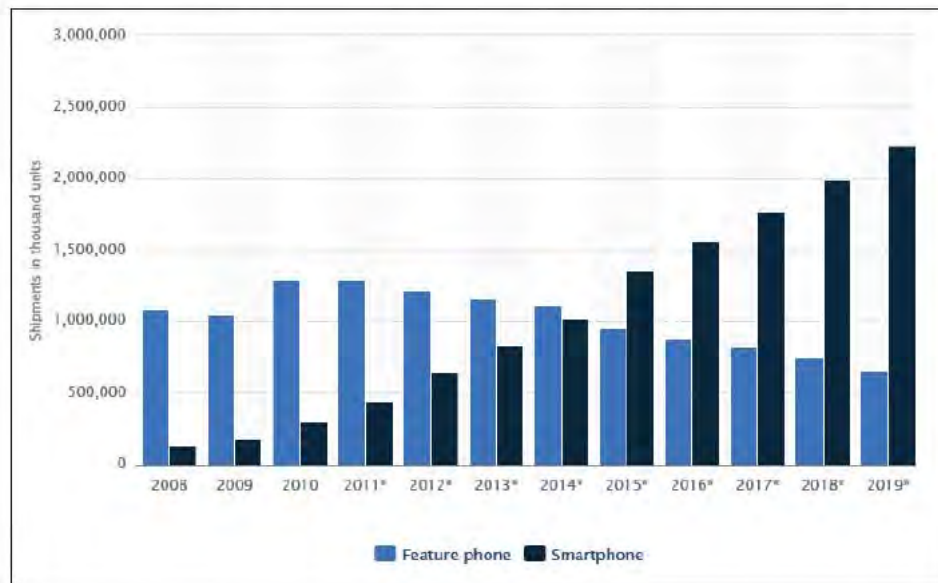
²⁶⁵ Deposition of Alan Brenner, December 15, 2015, p. 151.

²⁶⁶ Deposition of Alan Brenner, December 15, 2015, pp. 147-149.

²⁶⁷ <http://www.theguardian.com/technology/2014/jan/13/smartphone-explosion-2014-india-us-china-firefoxos-android>.



Figure 10
Summary of Historical Feature Phone and Smartphone Worldwide Shipments ²⁶⁸



209. A major reason feature phones remained a large portion of the market is due to their relatively low cost. Therefore, given Sun's dominance in the feature phone market, it was well positioned to capitalize on the opportunity which existed to transition feature phone users to smartphones, absent Google's infringement.

210. Sun was well aware of the evolving mobile phone market. [REDACTED]

[REDACTED]

211. [REDACTED]

[REDACTED]

²⁶⁸ "Feature phone and smartphone shipments worldwide from 2008 – 2020," The Statistics Portal, www.statista.com.

²⁶⁹ OAGOOGL0013331514 – 564 at 531; OAGOOGL0004936380-436 at 4non-.

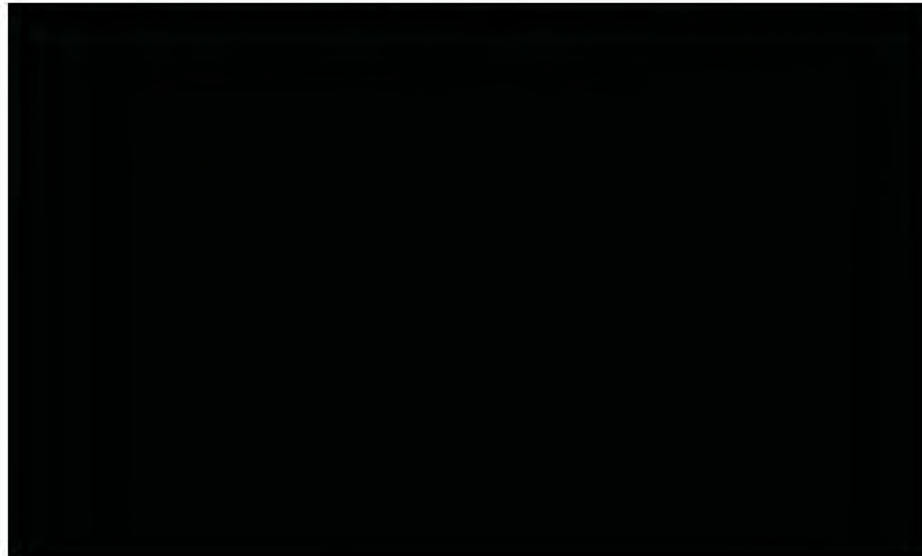
²⁷⁰ OAGOOGL0000337463; OAGOOGL0002304235; OAGOOGL0002304236 – 243 at 237; 242 – 243; OAGOOGL0000361417 – 418 at 417; OAGOOGL0001700059 – 061 at 061.

²⁷¹ OAGOOGL0004936380-436 at 428.



²⁷² [REDACTED]
[REDACTED]
212. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] The momentum Sun expected to capitalize on is expressed in the following Figure:

Figure 11
Sun Presentation Reflecting Java Penetration ²⁸¹



²⁷² OAGOOGL0011726508-539 at 514 -516.

²⁷³ OAGOOGL0013561757-786 at 783.

²⁷⁴ OAGOOGL0004950038-63 at 39.

²⁷⁵ OAGOOGL0004950038-63 at 54.

²⁷⁶ OAGOOGL0005117411-419 at 412.

²⁷⁷ OAGOOGL0005117411-419 at 413.

²⁷⁸ OAGOOGL0004936380-436 at 401.

²⁷⁹ OAGOOGL0005117411-419 at 419.

²⁸⁰ OAGOOGL0004936380-436 at 410.

²⁸¹ OAGOOGL0004950038-63 at 41.



213. As discussed in my Initial Report, [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED] To that point,
 Google also understood the value Java provided with respect to the transition from feature phones
 to smartphones, as evidenced by an August 2007 internal Google email which states: "I can tell you
 there are tens of thousands of Java developers who just can't wait to write mobile applications."²⁸⁴
214. [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]²⁸⁶
215. [REDACTED]
 [REDACTED]
 [REDACTED]²⁸⁷

5.8 Nokia's Role in Sun's Expansion Into the Smartphone Market

216. Sun's opportunity to obtain significant smartphone market share was in part due to its relationships
 in the industry. I understand that Nokia had 48 percent of the mobile device market share in
 2006.²⁸⁸ According to the Bloomberg Research "2006 was the year of the converged device with
 80 million smart phones shipped worldwide, according to analysts – and Nokia remains the
 unequivocal leader selling almost one in two smart mobiles."²⁸⁹ RIM was Nokia's nearest
 competitor, with six million phones and 7.5 percent of the market.²⁹⁰ Given Java was enabled on

²⁸² OAGOOGL0001872552 –555 at 552.

²⁸³ OAGOOGL0019801560-587 at 565-566.

²⁸⁴ GOOGLE-01-00029331-332 at 331; Trial Exhibit 387.

²⁸⁵ OAGOOGL0002778854-882 at 869.

²⁸⁶ OAGOOGL0002778854-882 at 882. RTOS refers to run-time OS which was commonly used in feature phones
 and tended to be proprietary; see for example, <http://www.visionmobile.com/blog/2009/07/feature-phones-and-the-rtos-the-ignored-85-of-the-market/>.

²⁸⁷ OAGOOGL0005039944 –962 at 947.

²⁸⁸ <http://www.bloomberg.com/bw/stories/2007-02-27/nokia-tops-in-2006-smartphone-salesbusinessweek-business-news-stock-market-and-financial-advice>.

²⁸⁹ <http://www.bloomberg.com/bw/stories/2007-02-27/nokia-tops-in-2006-smartphone-salesbusinessweek-business-news-stock-market-and-financial-advice>.

²⁹⁰ <http://www.bloomberg.com/bw/stories/2007-02-27/nokia-tops-in-2006-smartphone-salesbusinessweek-business-news-stock-market-and-financial-advice>.



the majority of these phones and Sun had relationships with both Nokia and RIM, it was well positioned to capitalize on the transition from feature phones to smartphones.

217. Throughout the unique window of opportunity, Sun and Nokia continued to address a changing market. Nokia recognized this opportunity as early as 2005, noting: “Mobile communications is converging in some areas with computing, digital imaging, and the internet, making it possible for consumers to use handheld devices for filming video, listening to music, playing games, surfing the web, and more. Nokia is shaping this converging industry, pushing it forward with cutting-edge products and the development of open standards.”²⁹¹ [REDACTED]

⁹²

218. Expectations for Nokia and Sun did not change until after Google shopped Android around privately to OEMs and carriers before publicly releasing Android in 2008, as reflected by the fact that, as late as 2007, “Nokia continue[d] to target an increase in its market share in mobile devices”²⁹³ Also, around that time, Nokia specifically identified competition and unlawful use of its intellectual property as a risk factors for its mobile device market share:

*Competition in the industry is intense. Our failure to maintain or improve our market position and respond successfully to changes in the competitive landscape may have a material adverse impact on our business and results of operations.*²⁹⁴

...

*Our products and solutions include numerous new Nokia patented, standardized, or proprietary technologies on which we depend. Third parties may use without a license or unlawfully infringe our intellectual property or commence actions seeking to establish the invalidity of the intellectual property rights of these technologies. This may have a material adverse effect on our results of operations.*²⁹⁵

219. [REDACTED]²⁹⁶ [REDACTED]

²⁹¹ Nokia 2005 Corporate Responsibility Report, p. 25

(<http://company.nokia.com/sites/default/files/download/nokia-cr-report-2005-pdf.pdf>).

²⁹² OAGOOGL0019801560-19801587 at 1565.

²⁹³ Nokia 2006 Annual Report, p. 6 (https://bib.kuleuven.be/files/ebib/jaarverslagen/NOKIA_2006.pdf).

²⁹⁴ Nokia 2006 Annual Report, p. 6 (https://bib.kuleuven.be/files/ebib/jaarverslagen/NOKIA_2006.pdf).

²⁹⁵ Nokia 2006 Annual Report, p. 6 (https://bib.kuleuven.be/files/ebib/jaarverslagen/NOKIA_2006.pdf).

²⁹⁶ Deposition of Alan Brenner, December 15, 2015, p. 151.

²⁹⁷ Deposition of Alan Brenner, December 15, 2015, pp. 227-234.



[REDACTED]

220. [REDACTED]

221. [REDACTED]³⁰⁵
 Around the time of Google's first infringement, Nokia was a leading brand in the mobile phone market, as evidenced by a 2005 Interbrand survey which identified Nokia as the world's sixth most valued brand.³⁰⁶ Also in 2005, a Top 100 Brands list included Nokia at number 6 and Google at 38.³⁰⁷ However, today Google has surpassed Nokia in terms of brand value, no doubt due (at least in part) to Android.

5.9 Sun/Oracle Investment in Java ME

222. Dr. Leonard has also opined that a lack of investment in Java ME was a cause of its revenue decline.³⁰⁸ However, Dr. Leonard's analyses and related opinions inappropriately rely on sources of information dated long after Android was first introduced in 2009.³⁰⁹
223. As support for his opinion that a lack of investment caused the decline in Java ME revenue, Dr. Leonard references deposition testimony that, in 2013 Oracle decided "not to focus on making a

²⁹⁸ Deposition of Alan Brenner, December 15, 2015, pp. 230-231.

²⁹⁹ Deposition of Alan Brenner, December 15, 2015, pp. 230-231.

³⁰⁰ Deposition of Alan Brenner, December 15, 2015, pp. 233-236.

³⁰¹ OAGOOGL2000181111-146 at 128

³⁰² OAGOOGL2000181111-146 at 136

³⁰³ Deposition of Vineet Gupta, July 26, 2011, pp. 280-282.

³⁰⁴ OAGOOGL0000457797-801 at 797.

³⁰⁵ OAGOOGL0002778854- 2778882 at 869.

³⁰⁶ "Nokia 2005 Corporate Responsibility Report," <http://company.nokia.com/sites/default/files/download/nokia-cr-report-2005-pdf.pdf>, p. 24.

³⁰⁷ http://www.businessweek.com/pdfs/2005/0531_globalbrand.pdf

³⁰⁸ Expert Report of Dr. Leonard, February 8, 2016, p. 116.

³⁰⁹ Expert Report of Dr. Leonard, February 8, 2016, pp. 116-119.



new major version of Java ME update, targeting the phone business, because we didn't believe that we would get a net option for it, basically."³¹⁰ Similarly, Dr. Leonard relies on deposition testimony that around April 2012, Java ME was an "old technology stack" and "if you wanted to continue to use and license Java ME and, in particular, to be able to compete with something like Android, you would have to make significant investments in it."³¹¹ Not only do these decisions made by Oracle more than five years after Google began using the Infringed Java Copyrights not support Dr. Leonard's opinions, they are consistent with (and provide support for) my opinion that Oracle was forced to alter expectations and plans for Java ME following Google's infringement.

224. That said, I note that Sun continued to invest in Java ME prior to and overlapping with the early stages of Android. According to a March 2009 Sun presentation, Sun estimated it would invest 49 percent of its anticipated Java wireless revenue on Research & Development (R&D).³¹² In this same presentation, Sun compared its Java related Research & Development investment to its "peers" that only invested 14 to 21 percent of total revenue.³¹³ This illustrates that Sun continued to make relatively significant R&D investments in Java throughout at least 2009.³¹⁴

6. RESPONSE TO DR. LEONARD'S TECHNICAL OPINIONS

6.1 Dr. Leonard Improperly Offers Many Technical Opinions

225. Dr. Leonard has independently offered many technical opinions for which he cites to no supporting technical evidence and/or opinions. Listed below are several examples of such opinions from Dr. Leonard:

- Google's contribution to the Android platform including the Linux kernel, Hardware Abstraction Layer, native libraries, core libraries, the Android framework, Android Run Time and Applications Layer;³¹⁵
- The potential effects of 'familiarity' with the 37 Java APIs were small at best;³¹⁶
- Even if the 37 Java APIs were 'stable' in and of themselves, their use would in no sense guarantee stability of Android as a whole;³¹⁷
- Any 'stability' that Java might have is not unique to Java;³¹⁸

³¹⁰ Expert Report of Dr. Leonard, February 8, 2016, p. 117.

³¹¹ Expert Report of Dr. Leonard, February 8, 2016, pp. 117-118.

³¹² Trial Exhibit 560, OAGOOGL0003388109-138 at 115.

³¹³ Trial Exhibit 560, OAGOOGL0003388109-138 at 115.

³¹⁴ Trial Exhibit 560, OAGOOGL0003388109-138 at 115.

³¹⁵ Expert Report of Dr. Leonard, February 8, 2016, pp 35-39.

³¹⁶ Expert Report of Dr. Leonard, February 8, 2016, p. 46.

³¹⁷ Expert Report of Dr. Leonard, February 8, 2016, p. 47.

³¹⁸ Expert Report of Dr. Leonard, February 8, 2016, p. 47.



- Any advantage Java offered over these other languages was small and also accompanied by disadvantages.³¹⁹

226. Dr. Leonard draws inappropriate and unqualified opinions about these (and other) technical topics as they relate to damages. In connection with offering these opinions, Dr. Leonard does not cite to any qualified technical opinion from a Google technical expert (or any other reliable source), and thus the conclusions he draws from such technical opinions are unsupported and unreliable.

6.2 Dr. Leonard's Technical Opinions Are Unreliable

227. Based on my discussions with Oracle's technical experts and my review of their expert reports, I understand each of the following technical opinions put forth by Dr. Leonard is unreliable.

6.2.1 Dr. Leonard's View Regarding Reasons for the Success of Android – Other Than the Alleged Infringement

228. Dr. Leonard cites reasons for the success of Android other than the infringement of the 37 Java APIs including Google's efforts, Google's decisions to make Android free and open source, and the efforts of OEMs.³²⁰
229. I understand that Dr. Schmidt has addressed this issue by investigating and determining that "Android is not usable on a computing device, such as a phone or tablet, without each of the Java API packages at issue or the copied declaring code in them."³²¹ Therefore, without use of the Infringed Java Copyrights, the additional efforts of Google, and the efforts of the OEMs would be moot since Android would not be functional without them.
230. Dr. Leonard states that "Google has provided ways for developers to write applications in programming languages other than Java... the Native Development Kit (NDK) allows a developer to write an Android application in C or C++"³²²
231. I understand that contrary to Dr. Leonard's opinion, Google has acknowledged that generally there is no performance increase in using the NDK and advises that "[b]efore downloading the NDK, you should understand that the NDK will not benefit most apps...Notably, using native code on Android generally does not result in a noticeable performance improvement, but it always increases your app complexity. In general, you should only use the NDK if it is essential to your app – never because you simply prefer to program in C/C++."³²³

³¹⁹ Expert Report of Dr. Leonard, February 8, 2016, p. 48.

³²⁰ Expert Report of Dr. Leonard, February 8, 2016, pp. 34-46.

³²¹ Expert Report of Dr. Schmidt, Jan 8, 2016, ¶ 78.

³²² Expert Report of Dr. Leonard, February 8, 2016, ¶ 76.

³²³ <http://developer.android.com/tools/sdk/ndk/index.html>.



232. Due to the fact that the initial NDK was available in 2009³²⁴, the NDK would not have been available to developers from 2008 to 2009. Thus, despite Dr. Leonard's assertions that alternatives to Java existed and developers had the option of choosing multiple programming languages, this was simply not the case - as support for other programming languages did not initially exist. Later, while the use of Java was encouraged, C++ became supported, but its use was discouraged by Google.³²⁵
233. Dr. Leonard states that, "Google contributed many popular Android applications that were important for getting the Android ecosystem off the ground... pre-loaded on many Android devices, including Google Maps, Gmail, YouTube and Google Play."³²⁶ I understand from Dr. Kemerer's analysis, "Android and its 'top apps' have a high dependency on the 37 Java APIs."³²⁷ Thus, Dr. Leonard's statements regarding Google's contribution could not have occurred without the Infringed Java Copyrights, which were an integral piece of the Google Mobile Services applications that Dr. Leonard refers to.³²⁸
234. I understand that Dr. Kemerer refers to centrality as "a metric that is used to describe the relative importance of a particular entity, or node, within a network of interconnected entities"³²⁹ and that Dr. Kemerer has found that the centrality of the copied code is 9.06 times greater than non-copied code. I understand that this analysis indicates "the classes Google copied are of consistently high centrality to the Java SE platform."³³⁰
235. Dr. Leonard does not appear to rely on any empirical evidence that the Linux Kernel, Android Runtime, Hardware abstraction layer and other components of the Android platform contribute to Android's success. I understand the only empirical evidence in the case is from Dr. Kemerer and Dr. Schmidt and they have demonstrated that the 37 APIs are central to the success of the platform. The relative contribution of the other components cited by Dr. Leonard have not been attributed to any technical analysis for support.

6.2.2 Dr. Leonard's View Regarding 37 APIs Valued Equally to Other Android APIs

³²⁴ <http://android-developers.blogspot.com/2009/06/introducing-android-15-ndk-release-1.html>; http://developer.android.com/ndk/downloads/revision_history.html; <http://android-developers.blogspot.com/2009/06/introducing-android-15-ndk-release-1.html>

³²⁵ <http://developer.android.com/tools/sdk/ndk/index.html>

³²⁶ Expert Report of Dr. Leonard, February 8, 2016, ¶ 79.

³²⁷ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 160.

³²⁸ Expert Report of Dr. Leonard, February 8, 2016, ¶ 79.

³²⁹ Expert Report of Dr. Kemerer, February 8, 2016, ¶ 28.

³³⁰ Expert Report of Dr. Kemerer, February 8, 2016, ¶ 41.



236. Dr. Leonard claims “the 37 Java APIs at issue constitute only a small portion of the overall Android code base,”³³¹ and his “top-down” apportionment analysis implicitly assumes equal weighting of the Infringed Java Copyrights relative to other aspects of the Android platform.
237. I understand Dr. Kemerer has performed stability and centrality analyses to determine the relative importance of the 37 Java API packages to the Android platform. I also understand he has found that “the 37 Java APIs are highly central within the Android platform compared to the non-copied APIs and, thus, Google copied a substantial portion of the Java SE platform.”³³² I also understand that Dr. Kemerer found that the 37 Java APIs contributed to stability of the Android platform and the 37 Java APIs are also important to many popular apps.³³³
238. Also, as discussed previously in Section 6, I also understand that the 37 Java APIs contribute greater value to Android than other aspects of the Android platform.

6.2.3 Dr. Leonard’s View Regarding Minimal Advantages of Java – Other Programming Languages Were Considered

239. Dr. Leonard has asserted that Google could have chosen to use one of many other existing applications programming languages and “[a]ny advantage Java offered over these other languages was small and also accompanied by disadvantages.”³³⁴
240. I understand that Google chose to base the Android platform on the 37 Java APIs because of the Java platform’s key attributes, as explained by Dr. Schmidt.³³⁵ Some of these attributes include the popularity of the Java platform, as well as the many tools “available for writing, refactoring, debugging, optimizing, and deploying Java applications.”³³⁶ I also understand that other existing applications programming languages did not offer these key attributes, and thus Dr. Leonard’s statement that “Google could have chosen to use one of many other existing applications programming languages”³³⁷ is without basis and empirical support.
241. I also note the previously discussed Court order confirming that consideration of non-infringing alternatives for the purpose of evaluating wrongful profit is improper. As Dr. Leonard is now taking a similar position regarding non-infringing alternatives, it is equally irrelevant. That being said, I understand there were other options that had the key benefits of the Java platform available to Google for the reasons discussed in Dr. Schmidt’s expert report. Dr. Schmidt explains that

³³¹ Expert Report of Dr. Leonard, February 8, 2016, p. 47.

³³² Expert Report of Dr. Kemerer, January 8, 2016, section VI(c); February 8, 2016 report, section VI(B).

³³³ Expert Report of Dr. Kemerer, January 8, 2016, section VI(b) and p.39-41; February 29, 2016 report, sections IV, V.

³³⁴ Expert Report of Dr. Leonard, February 8, 2016, ¶ 100.

³³⁵ Expert Report of Dr. Schmidt, January 8, 2016, p. 31.

³³⁶ Expert Report of Dr. Schmidt, January 8, 2016, p. 31.

³³⁷ Expert Report of Dr. Leonard, ¶ 100.



“while a number of different language platforms offered useful features in the mid-2000s, none combined the value of an app developer friendly platform with published specifications intended to ensure compatibility that was widely adopted by a large number of app developers.”³³⁸ Dr. Schmidt further explains the drawbacks and deficiencies of numerous platforms that Google considered and declined to implement in favor of the Java platform.³³⁹ Thus, the Java platform including the 37 Java APIs was the best option available to Google and all of Dr. Leonard’s unsupported statements directed to the minimal advantages associated with the Java platform are incorrect and unreliable.³⁴⁰

6.2.4 Dr. Leonard’s View Regarding Lack of Importance of Java Developers Familiarity with Android

242. Dr. Leonard states that “economic evidence demonstrates that these potential effects of “familiarity” with the 37 Java API packages were small at best, which would mean that the contribution of the alleged infringement to Android-related profits was small as well.”³⁴¹
243. I understand that Dr. Schmidt explained that, for developers, “writing code in general, and reusable APIs in particular, is a time consuming and highly creative effort that requires considerable resources and creative effort.”³⁴² I also understand from Dr. Kemerer that “Google benefited from using the copied code and the structure, sequence and organization of the 37 Java API packages to leverage their popularity and familiarity among developers in order to quickly attract developers to the Android platform when it was first created.”³⁴³
244. I also understand that Daniel Bornstein, the key architect of the Dalvik virtual machine was asked “[w]hy did the Android team select Java to be the main language for Android” and he explained that “there was a good open source community around developers that use the Java programming language. There were good tools, such as Eclipse, that were other open source tools that worked with that programming language. There were already a number of good open source libraries written in the programming language. I think all of these things were – I guess I would consider all of those things to be sort of, so to speak, in favor.”³⁴⁴
245. I understand that Dr. Schmidt described many of the key attributes of the Java platform including enhanced programmer productivity, increased app security, and efficient garbage collection for memory management in order to build more efficient applications.³⁴⁵ Since none of the other

³³⁸ Expert Report of Dr. Schmidt, February 29, 2016, ¶ 43.

³³⁹ Expert Report of Dr. Schmidt, February 29, 2016, pp 19-21.

³⁴⁰ Expert Report of Dr. Schmidt, February 29, 2016, Sections VI(B) and (C).

³⁴¹ Expert Report of Dr. Leonard, ¶ 97.

³⁴² Expert Report of Dr. Schmidt, February 8, 2016, ¶ 194.

³⁴³ Expert Report of Dr. Kemerer, February 8, 2016, ¶ 108.

³⁴⁴ Deposition of Daniel Bornstein, May 16, 2011, pp 48-49.

³⁴⁵ Expert Report of Dr. Schmidt, February 29, 2016, ¶ 33.



platforms available to Google at the time had these advantages, the importance of attracting Java developers to the Android platform was a significant motivating factor for Google to adopt Java and it was necessary for Google to copy the 37 Java APIs in order to so.

246. Google was faced with the option of adopting a different platform, which it was not able to for the reasons explained above, or creating its own set of APIs to function in the same way as the 37 Java APIs. As Dr. Schmidt indicated, developing an independent platform would have involved “time, effort and technical risk”³⁴⁶ and due to Google’s time pressures it was not in a position to develop anything similar internally in the time window that it faced. Thus, it is clear that Java was the only option that Google had in order to attract developers to the Android platform.

6.2.5 Dr. Leonard’s View Regarding the Ease with Which Programmers Move from one Language to the Next

247. Dr. Leonard states that “it would have been as easy for an applications developer who had written an iPhone application in Objective C to port that application to C/C++ for use in Android as it was to port it to or write it from scratch in the Java programming language.”³⁴⁷ He also opines that “[p]rogrammers familiar with one language typically find it relatively easy to pick up other languages.”³⁴⁸
248. As discussed previously, although a skilled programmer is likely familiar with multiple programming languages, in order to build a robust mobile application in multiple programming environments that will remain stable for increasing number of users, such as the Facebook or Yelp applications, it would require significant additional time and effort. Although programmers may be trained in multiple languages, Dr. Leonard conflates the ability of a programmer to code in multiple languages with a programmer’s ease of accurately and effectively developing robust commercial applications in multiple programming languages.
249. At Google I/O in May 2011, Google announced that there were 450,000 Android developers around the world.³⁴⁹ It is unlikely that the number of Android developers would have been significant if a new programming language was required to learn in order to develop for the new platform. In February 2015, Intel mentioned “millions of Android developers are dedicated to building stable and scalable applications.”³⁵⁰ As of 2014, Android was catching up to iOS in terms of developer preference and there is considerable overlap in terms of how developers classified their primary and secondary platform preferences.^{351,352} Therefore, I understand that programming

³⁴⁶ Expert Report of Dr. Schmidt, February 29, 2016, ¶ 36.

³⁴⁷ Expert Report of Dr. Leonard, February 8, 2016 ¶ 106.

³⁴⁸ Expert Report of Dr. Leonard, February 8, 2016 ¶ 107.

³⁴⁹ <http://www.cnet.com/news/google-amps-up-the-media-experience-live-blog/>.

³⁵⁰ <https://software.intel.com/en-us/android/articles/tips-for-optimizing-android-application-memory-usage>.

³⁵¹ <http://readwrite.com/2014/01/14/tablet-developers-now-target-android-but-where-the-money>.

³⁵² <http://www.developereconomics.com/report/q3-2013-the-multi-platform-developer/>.



languages are not interchangeable and it is a non-trivial task to learn a new language and program proficiently in it, otherwise there would not be a distinction between preferences for platform languages.

6.2.6 Dr. Leonard's View Regarding Stability of Java v. Stagnation

250. Dr. Leonard states that “Sun’s Java platform (and its APIs) did not change not because of “stability”, but because Sun stopped innovating. Stagnation (lack of innovation) is not a positive and, in fact, this stagnation explains why Java’s popularity was declining prior to the introduction of Android.”³⁵³
251. I understand that Dr. Leonard’s view regarding the stagnation of Java is factually incorrect. All of the 37 Java APIs at issue have been a core part of the Java platform since at least September 2004, and I understand that some portion of the 37 Java APIs have been a core part of the Java platform since its earliest releases.³⁵⁴ I understand that the 37 Java APIs have enabled additional functionality to be built on top of them and that the 37 Java APIs are routinely called by other APIs within the platform.³⁵⁵ Java had an established ecosystem which included the following attributes enumerated by Dr. Jaffe: widespread acceptance among vital platform partners like OEMs and wireless carriers; a familiar, well-tested applications platform that ran predictably, a stable, educated deep-rooted developer community; and the ability to reach the market faster with a technically stable, lower-risk commercially successful product.³⁵⁶
252. I understand that Dr. Kemerer conducted “an analysis of the importance of the 37 Java APIs to the Android platform by assessing the degree to which they contributed to the stability of the Android platform.” In connection with preparing that analysis, I understand he considered “the relative changes in the method declarations of the 37 Java APIs copied in Android, as compared to other APIs in the Android core libraries and frameworks” and found “[T]here is much less change and thus much greater stability of the 37 Java APIs, compared to other APIs in Android.”³⁵⁷ I understand that since the 37 Java APIs were more stable than the rest of the APIs in Android, the stability of the 37 Java APIs would necessarily provide more stability to the Android platform, contrary to what Dr. Leonard states. These 37 Java APIs did not change, not because of stagnation, but because they were optimized for efficiency and did not require further changes.
253. Therefore, I understand that the Java platform was not stagnant in any sense, but provided a stable platform that served as the basis on which Google, BlackBerry, Amazon and other companies built

³⁵³ Expert Report of Dr. Leonard, February 8, 2016, p. 47.

³⁵⁴ Expert Report of Dr. Kemerer, January 8, 2016, p. 3

³⁵⁵ Expert Report of Dr. Kemerer, January 8, 2016, ¶ 51; Expert Report of Dr. Schmidt, February 8, 2016, ¶¶ 233 and 237.

³⁵⁶ Expert Report of Dr. Jaffe, February 8, 2016, ¶ 161; Expert Report of Dr. Kemerer, February 8, 2016, ¶ 103.

³⁵⁷ Expert Report of Dr. Kemerer, February 8, 2016, ¶ 55.



reliable large-scale commercial products. I note that this issue is also addressed in my response to Dr. Leonard's lost profit opinions.

6.2.7 Dr. Leonard's View that iPhone Success Shows Familiarity of Platform not Indicator of Success

254. Dr. Leonard claims that "despite the lower levels of familiarity with Objective C, there has been an explosion in applications developed for the iPhone. This shows that developers are willing and able to respond to market opportunities by adapting and learning to program in previously unfamiliar languages."³⁵⁸
255. As I discussed previously, I understand developer interest and acceptance in programming in Objective C is incentivized largely by the attractive developer revenue-sharing model that Apple provides for its developers, and not because developers prefer a lesser known language like Objective C over a widely known language like Java. I also understand this is not an indication that programmers are less inclined to using a familiar language, rather this is an indication that the financial incentives for developers to recoup their costs by developing on the iOS platform are higher. Dr. Leonard appears to reach an incorrect conclusion on the success of a smartphone platform by basing it solely on the developer revenue sharing model of a digital distribution platform.
256. Dr. Leonard uses reductive logic to minimize the importance of the Java platform, but he fails to address the fact that, if Android had not chosen the Java platform for use in Android, there would not have been an ecosystem of OEMs, carriers, and developers for Google to monetize. The Java ecosystem of OEMs, carriers, and developers was already in place and by using the Java platform for the Android platform, Google could readily go to market and not be far behind Apple. Simply implementing a different programming language overlooks all of the related features of a platform's success.
257. Moreover, Dr. Leonard fails to consider other aspects of these mobile platforms that would factor into developer choice. For example, some developers prefer to develop first for iOS because there is no fragmentation and there is consistency in hardware. iOS developers do not need to account for many different physical specifications across the same class of device, unlike Android developers. Additionally, in a tightly-controlled environment like iOS, developers can "get the details right" first and then port their apps over to Android.³⁵⁹
258. Lastly, as seen below, some developers choose to develop for whatever platform is in a language that they are familiar with already.

³⁵⁸ Expert Report of Dr. Leonard, February 8, 2016 ¶ 117.

³⁵⁹ <http://tech.co/android-ios-development-2015-04>.



When Apple released the iPhone SDK in 2008, I had already been working with the Objective-C programming language for several years. Developing for iOS was very easy to explore. I bought some iOS programming books, but I already had enough knowledge to get started. Nowadays, I only need to consult API documentation. If I had found significant stumbling blocks with iOS, I could've made the decision to switch to another platform such as Android.³⁶⁰

6.2.8 Dr. Leonard's View that Blackberry's Lack of Success Shows that Java Platform is Not an Indicator of Success

259. Dr. Leonard states that, "despite having Java as an applications programming language and despite offering users many of the same most popular apps as Android, BlackBerry quickly lost out to the iPhone and Android handsets. This demonstrates the minor role that the particular choice of applications programming language plays in the success of a platform as compared to the features of the hardware, features of the operating system itself, and strategic choices of the vendor."³⁶¹ I find his analysis flawed for several reasons.
260. First, I understand that Dr. Kemerer found that "[o]ne of the contributing factors to this decline [of BlackBerry market share] was the relative dearth of BlackBerry apps measured against their competitors" and such industry examples "stress the important role of the app developer community in bolstering the health a mobile platform."³⁶² Thus, the selection of the Java platform for use in BlackBerry was actually not the reason for BlackBerry's competitive struggles; instead, it was the lack of available applications, among other market constraints. In addition, BlackBerry had been a successful Java-based platform in the late 1990s to mid-2000s and as of September 2008, BlackBerry had 50% of the smartphone market in the US.³⁶³ Therefore, Dr. Leonard has failed to understand and accurately apply the issues that caused BlackBerry's recent lack of success, and incorrectly attributes BlackBerry's decline to Java, which is clearly not based on historical facts.
261. I understand the very choice to use the Java platform for Android is what allowed Android to achieve platform success in a short timeframe because, by doing so, Android was able to leverage the already existing ecosystem of OEMs, carriers, and developers that Sun had spent years cultivating around the Java platform.
262. Android emerged in 2008, when smartphone demand was beginning to come from consumers rather than enterprise customers. Consumers wanted phones that could do more than just communicate and enable productivity – they wanted phones that could entertain them.³⁶⁴ Around the same time, the financial crisis decimated enterprise demand for high-end handsets. Macquarie Capital wrote in a 2009 equity research report: "we believe that the increasing willingness of

³⁶⁰ <http://tech.co/android-ios-development-2015-04>.

³⁶¹ Expert Report of Dr. Leonard, February 8, 2016 ¶ 121.

³⁶² Expert Report of Dr. Kemerer, February 9, 2016, ¶ 112.

³⁶³ <http://www.foxnews.com/story/2008/09/09/blackberry-maker-snags-half-us-smartphone-market.html>.

³⁶⁴ <http://www.informationweek.com/smartphone-consumer-demand-growing/d/d-id/1090441>.

EXHIBIT G
PART 4 OF 6

**REDACTED VERSION OF
DOCUMENT SOUGHT TO BE
SEALED**



enterprises to provide mobile email to employees will slow in the global recession. This will especially be the case in North America and the credit crisis has decimated traditional RIM customers such as banks and law firms.”³⁶⁵ Analysts also expected “RIM to face increasing competition as it struggles in an increasingly competitive [enterprise] sector. As a result of Apple and Android device popularity, we anticipate reduced demand from RIM’s traditional stronghold, enterprise users.”³⁶⁶

263. BlackBerry launched its app store, BlackBerry App World in 2009, almost a full year after Google and Apple had launched their respective app stores. Moreover, their traditional user base of “large corporate customers didn’t want personal applications on corporate phones,” which would have depressed demand for apps on the BlackBerry platform rather than any shortcoming of Java.³⁶⁷
264. Therefore, Dr. Leonard’s analysis of the “BlackBerry experience” is flawed because it fails to consider the contextual factors that contributed to BlackBerry becoming sidelined as a platform. Dr. Leonard’s analysis is further flawed because he fails to consider that BlackBerry actually had been a successful Java-based platform in the late 1990s to mid-2000s, before Android entered the market. In September 2008, BlackBerry had 50% of the smartphone market in the US and at its peak during the 2007-2015 time period, it had about 12% of the overall mobile phone market in the US.³⁶⁸ All BlackBerry phones from BlackBerry OS 7 and earlier were Java-based.³⁶⁹ Finally, although the BlackBerry OS was Java-based and proprietary, developers did not seem to find Java or the closed nature of the platform a deterrent: “The BlackBerry OS platform was limited to Java and HTML5. While not actually more difficult to develop for, creating a genuinely good app experience on a BlackBerry OS app was much harder.”³⁷⁰ In actuality, other features of the BlackBerry OS platform, such as cumbersome development tools and an unestablished app store, deterred developers from building for the platform.³⁷¹
265. For all of the reasons above, it is improper for Dr. Leonard to conclude that Java as a platform choice played a role in BlackBerry’s lack of success.

³⁶⁵ February 2009 Macquarie Capital Equity Research Report.

³⁶⁶ June 20, 2011 Equity Research Report on RIM, Macquarie.

³⁶⁷ <http://www.theglobeandmail.com/report-on-business/the-inside-story-of-why-blackberry-is-failing/article14563602/?page=all>.

³⁶⁸ <http://www.foxnews.com/story/2008/09/09/blackberry-maker-snags-half-us-smartphone-market.html>; Expert Report of Dr. Leonard, February 8 2011, Exhibit 5a.

³⁶⁹ <http://www.zdnet.com/pictures/a-history-of-blackberry-in-nine-iconic-handsets-and-one-meh-tablet-photos/2/>; <http://www.blackberry.com/news/connection/200201.shtml>; <http://www.javaworld.com/article/2073501/blackberry-going-with-qnx--java-me-to-lose-its-highest-profile-os-.html>

³⁷⁰ <http://n4bb.com/memory-leaks-dark-blackberry-7/>; <https://www.quora.com/Is-developing-apps-for-BlackBerry-OS-more-challenging-than-developing-apps-for-iOS-and-Android#>.

³⁷¹ <https://spin.atomicobject.com/2010/11/22/the-cost-of-building-blackberry-apps/>; <http://www.digitaltrends.com/mobile/blackberrys-app-world-can-it-ever-catch-up-to-apple-android/>.



6.2.9 Dr. Leonard's View Regarding the OpenJDK

266. Dr. Leonard states that “[t]he fact Sun chose to open-source its Java SE reference implementation including the allegedly copyrighted material, demonstrates that the contribution of the allegedly infringing material to the value (profit) of a platform like Android was not particularly large.”³⁷²
267. I understand that Gwyn Murray has concluded that “Google’s incorporation of OpenJDK-based code in the master branch of Android poses a significant risk that additional elements of the Android stack (including modifications made by OEMs) would be subject to the requirements of GPLv2CE.”³⁷³ I also understand that Dr. Kemerer found that “OpenJDK is not pertinent to the impact of Google’s use on the market for Java, because Google would never have accepted the license for OpenJDK” and because OEM’s would not have accepted GPLv2CE either.³⁷⁴ Finally, I note the record evidence shows that Google did not in fact accept the license for OpenJDK.³⁷⁵
268. Dr. Leonard appears to incorrectly assume that the 37 Java APIs in OpenJDK would function in Android in the same way as the 37 Java APIs from Java SE. However, I understand that, had Google opted to use OpenJDK at the time Android was first announced, it would have been a high business risk for Google that OEMs would have rejected Android and not a risk they were willing to take. Indeed, Google intentionally did not opt for OpenJDK before releasing Android.³⁷⁶

7. RESPONSIVE OPINIONS REGARDING APPORTIONMENT

7.1 Apportionment Framework for Infringer’s Profits

269. I understand that, when apportioning profits, an expert should not consider the infringing work’s quantitative share of the total, but rather its relative value to the overall work.³⁷⁷ I also understand an expert should consider the relative quality of the various components of an overall work, and where the infringing portion gives the infringing firm a unique claim or the ability to market something it otherwise couldn’t, the qualitative contribution of the infringed work – and not merely its simple pro rata share of the total work – should guide the apportionment analysis.³⁷⁸

³⁷² Expert Report of Dr. Leonard, February 8, 2016, p. 72.

³⁷³ Murray report, ¶ 164.

³⁷⁴ Expert Report of Dr. Kemerer, February 8, 2016, ¶¶ 25 and 258.

³⁷⁵ Trial Exhibit 154; Trial Exhibit 230.

³⁷⁶ Trial Exhibit 154; Trial Exhibit 230.

³⁷⁷ Litigation Services Handbook, The Role of the Financial Expert (Third Edition), Roman L. Weil, Michael J. Wagner, Peter B. Frank (2001) Chapter 22. p. 7.

³⁷⁸ Litigation Services Handbook, The Role of the Financial Expert (Third Edition), Roman L. Weil, Michael J. Wagner, Peter B. Frank (2001) Chapter 22. p. 7.



270. As such, an apportionment based on the pro-rata share a copyright holds of an overall work (e.g. lines of code as a percentage of total lines of code) ignores the relative value of the copyright. In this current matter, although the Infringed Java Copyrights may represent a small portion of the entire Android source code, as discussed previously in this report and throughout my Initial Report, the Infringed Java Copyrights provided Google with very significant and valuable benefits including, but not necessarily limited to: 1) credibility with key launch business partners—carriers and OEMs; 2) faster time to market; 3) access to a large Java developer network; 4) stability and reliability.³⁷⁹ In addition, as discussed in my Initial Report and herein, the technical centrality analysis performed by Dr. Kemerer demonstrates that the lines of code associated with the Java APIs are more significant than the other Android API lines of code. This centrality analysis alone shows that a lines of code comparison is an inappropriate measure of value.
271. As discussed in Section 4.5 and Section 4.6, I believe Dr. Leonard's approaches to apportioning Google's causally connected profits are fundamentally flawed, and therefore unreliable. Thus, I have prepared an alternative apportionment analysis that is set forth in the following section.

7.2 Profits Apportioned to the Android Platform and Therefore to the Java APIs

7.2.1 Commingling Theory and Legal Basis for Claiming 100% of Platform Contribution

272. As discussed previously, my apportionment analysis is consistent with the application of the legal theory of commingling and is therefore based on 100% of the value of the Platform Contribution. I find application of that legal theory would be appropriate in this case because Google knowingly assumed the risk of its failure to obtain a license and created the scenario whereby the relative contributions of the Java APIs to the total Platform Contribution are extremely difficult, if not impossible, to discern with reasonable certainty. My opinion is also consistent with the overall business circumstances. As previously described, Google faced an extremely competitive landscape with a very limited window of opportunity, and had to obtain the cooperation of numerous other mobile industry participants in order to make a successful launch of the Android Platform. Those industry participants were familiar with (and comfortable with) Java in mobile phones. Java represented a significant portion of the market at the time, and Google overtly capitalized upon that familiarity and comfort with the very important audience of carriers and OEMs. Furthermore, the technical expert evidence also shows that Android is dependent upon the Java APIs, that the Java APIs provided stability to the Android Platform during the critical launch period, and that the Java APIs are centrally important to the Android Platform and its most popular applications. Under these circumstances, use of the commingling standard is appropriate because the Java APIs are properly viewed as a "gating item" to the Android Platform.

7.2.2 Infringed Java Copyrights Enabled the Realization of Android Revenues

273. As summarized in Exhibit 8, the Infringed Java Copyrights enabled the realization of revenue from advertising, the sale of Application, the sale of Digital Content, and the sale of Hardware.

³⁷⁹ Expert Report of James E. Malackowski, January 8, 2016, pp. 86 to 93



7.2.2.1 Search, AdSense and Display Ad Revenues

274. Revised Exhibit 8.1 summarizes the annual Advertising Revenue Google realized from Android devices for the period 2008 through 2015.³⁸⁰ As Revised Exhibit 8.1 illustrates, Google realized [REDACTED] in Ad Revenue during that eight-year period. The Leonard Report reflects the same [REDACTED] total, however, Dr. Leonard allocated Ad Revenue among Search, AdSense and Display for the four-year period 2008 to 2011. In Revised 8.1, I have updated my summary of Android Advertising Revenue to reflect Dr. Leonard's disclosures relating to the years 2008 to 2011.
275. As reflected in Revised Exhibit 8.1, the Advertising Revenue Google realized from Android devices grew from \$0.7 million in 2008, to an annualized total of [REDACTED] in 2015, and total [REDACTED] Search (AdWords) led with [REDACTED], followed by Display with [REDACTED], and AdSense with [REDACTED], during this eight-year time period.

7.2.2.2 Application and Digital Content Revenues

276. Google began selling Apps through Android Market/Google Play in 2009. Exhibit 8 reflects Google's [REDACTED]³⁸¹ of total revenue from sales of paid-for-Apps downloaded from Android Market/Google Play, which [REDACTED] share totals [REDACTED] during the eight-year period 2008 to 2015.
277. Google began selling music, movies and other Digital Content through Android Market/Google Play in 2011. Exhibit 8 reflects 100 percent of the [REDACTED] of revenue from downloaded Digital Content through Android Market/Google Play for the years 2011 to 2015.³⁸²

7.2.2.3 Android Devices including Nexus Smartphones ([REDACTED])

278. Google began selling Nexus devices in 2010. Exhibit 8 reflects to [REDACTED] of revenue Google realized from sales of Nexus phones, tablets, watches and accessories³⁸³ for the years 2010 to 2015.

7.2.3 Platform Contribution

279. Revised Exhibit 7 summarizes the profit Google realized through the Android platform during the period 2008 through 2015. As that Exhibit illustrates, from 2008 through 2015, Google realized [REDACTED] of profit from the Android platform during that eight-year time period. Revised Exhibit 7 reflects total TAC of [REDACTED]. This total is [REDACTED] higher than the total reflected in Exhibit 7 to my Initial Report, and reflects the annual estimates of Android TAC calculated in

³⁸⁰ Since my initial report, I understand that Jonathan Gold was deposed for a second day. I understand that during that second day, he prepared a chart of Google's Android-related revenues. Deposition of Jonathan Gold, January 29, 2016; Deposition Ex. 5119.

³⁸¹ Google shares App Revenue with App developers. Deposition of Jonathan Gold, December 11, 2005, p. 73.

³⁸² Deposition of Jonathan Gold, December 11, 2015, pp. 38–39, 72.

³⁸³ Deposition of Jonathan Gold, December 11, 2015, p. 70.



Exhibit 7.2 for the years 2011 to 2015. I made this revision to ensure my TAC calculation was specific to the revenue streams at issue.

280. The Figure below is a summary of the analysis I performed to identify the portion of the profits Google realized through Android devices that is attributed to the Android platform, and therefore to the Java APIs.

Figure 12
Profit Apportioned to Infringed Java Copyrights

Apportionment of Android Related Profit	Amount (in millions)
Gross Profit of Android Ad Revenues	██████████
Platform Contribution Factor	██████████
Advertising Gross Profit Apportioned to Platform	██████████
Plus: Gross Profit of Other Android Revenue	██████████
Less: Android Sales and Marketing Expense	██████████
Profits Apportioned to Infringed Java Copyrights	\$8,829.4

7.2.3.1 Advertising Gross Profit Apportioned to Platform (And Therefore Infringed Java Copyrights)

281. As discussed above, in response to an Order regarding an Oracle Motion to Compel,³⁸⁴ Google produced Google's Non-Android Mobile O.S. Partner List. For six Google non-Android Mobile O.S. Partners, this document provides: 1) the percentage of Search Revenue Google shares with the partner; 2) the total gross revenue earned by Google under the agreement; and 3) the Google search services which are the subject of each agreement. Exhibit 7.6 is a calculation of the weighted average percent of Search Revenue which Google shares with all six Partners reflected in Google's Non-Android Mobile O.S. Partner List. Exhibit 7.6 indicates that since 2006, Google has paid to non-Android Mobile Operating System Partners, ██████████ of the Search/Ad Revenue it earns from the mobile devices of those partners.
282. This factor of ██████████ represents an agreed-upon measure by Google and other disinterested third parties as to the value that the platform plays in generating the advertising revenue. Google agrees to pay the other non-Android mobile platform providers their share of the value generated by the advertising for their platforms.
283. When applied to Google's advertising revenues, this factor of ██████████ fairly represents the Android platform contribution to Google's mobile advertising business strategy. In the Figure above, I apply this factor to the gross profit from Android Ad Revenue of ██████████ to

³⁸⁴ Order Re: Motion to Compel, 3:10-cv-03561-WHA, Docket No. 1436, January 20, 2016, p. 1..



determine the Ad Revenue attributed to the Android platform. As the Figure illustrates, [REDACTED] of Android Ad Revenue is apportioned to the Android platform.

284. The remaining amount after applying the Platform Contribution Factor is not included in the disgorgement calculation. By giving Google credit for the other [REDACTED] of the profits, Google is receiving the value of its contributions for its advertising display network, its search engine, its branding and the other elements of value I identified in my Initial Report.
285. When it comes to the Platform, however, I have not further subdivided the value between the Infringed Java Copyrights and the Google contribution. As the technical analysis of Dr. Schmidt reveals, Google appears to have contributed only 26 percent of the code to the Platform and borrowed the remainder. On the other hand, Sun and Oracle unwillingly contributed code that turned out to be of vital importance to the Android Platform. This is where Google's commingling makes it extremely difficult to separate out the items of value. And, this is also where I have applied my judgment as an expert in light of the business circumstances that Google faced at the time to determine that the Java APIs were a gating item to the successful launch of the Android platform. In light of that significance, it is in my opinion appropriate to credit the Infringed Java Copyrights with the entire value of the Platform Contribution. Any other calculation risks allowing Google to retain a substantial portion of profits generated by the Infringed Java Copyrights.

7.2.3.2 Gross Profit of Other Android Revenue

286. 100 percent of the gross profit Google realized from Applications and Digital Content sold through Android Market/Google Play and 100 percent of the loss from sales of Android Hardware is attributed to the Android platform. Exhibit 7.7 provides the calculation for the [REDACTED] figure reflected in the previous Figure. As Exhibit 7.7 illustrates, included within this calculation is [REDACTED] of Infrastructure and Other Cost of Sales.
287. The reason that 100 percent is credited to the Platform in these line items is because Google has already split the value of these revenues with its business partners, and therefore has obtained only that share they have determined represent its contribution. So, for example, the app developers publishing applications in the Google Play Store pay [REDACTED] to Google for its contribution. In my view, these agreements are a reasonable proxy for the platform contribution in the case of these lines of business.
288. As before, and for the same reasons explained above, I have not further subdivided the Platform Contribution. Indeed, given the dependency of popular Android applications on the Java APIs, one could certainly make the case that the contribution is even stronger with respect to these lines of business. However, my calculation does not expect Google to disgorge profits it did not realize.

7.2.3.3 Certain Android Expenses

289. As reflected in the above Figure, 100 percent of Google's Sales and Marketing related operating expenses have been attributed to the Android platform.



290. The Google reported operating results for the Android platform summarized in Revised Exhibit 7 includes Android related Research and Development (“R&D”) and Legal Expenses. As part of my calculation of Platform Contribution, I have excluded these expenses.
291. In the case of [REDACTED] in legal expenses,³⁸⁵ I do not consider it appropriate to deduct these expenses. I was willing to provisionally include them in my initial profit calculations pending an explanation by Google. However, Dr. Leonard’s report contains no basis for concluding that these expenses are variable with respect to producing the revenue at issue, as the Court has required. Deducting these expenses is also the equivalent of making Oracle pay a share of these expenses, which may be improper.
292. The same is true of R&D expenses. While I provisionally included them in my Initial Report, Dr. Leonard’s report offers no evidence demonstrating that they are variable rather than fixed expenses as required by the Court. I therefore removed the R&D costs in making my apportionment calculation. Further, I consider the costs Google incurred in connection with Android R&D to be an investment by Google. Even assuming Google is required to stop infringing the Java APIs, it does not lose the value of this investment. Google is not likely to entirely abandon the Android platform when it has 1.5 billion active users continuing to generate revenue. Treating this R&D expense as a capital expenditure in this context makes it the economic equivalent of an asset that Google will retain. Even if Google stops infringing, Oracle does not receive this asset. Oracle therefore should not pay for the asset. As reflected in Revised Exhibit 7, over the period 2008 to 2015, Google invested more than [REDACTED] in R&D in connection with the Android platform.

7.2.3.4 Profit Apportioned to Infringed Java Copyrights

293. As illustrated in the Figure above, I attribute to the Android platform, and therefore to the Infringed Java Copyrights, \$8.8 billion of the [REDACTED] of total profit Google reported to have realized from the Android Platform during the years 2008 to 2015.
294. Google would face no financial difficulty if asked to disgorge this sum, as its public financial reports indicate that it possesses cash, cash equivalents and marketable securities exceeding \$73 billion.³⁸⁶

7.2.4 Costs, Expenses and other Business Factors Considered

295. I have accounted for or otherwise considered the contribution of factors other than the Infringed Java Copyrights to the Android Platform. The specific costs, expenses, and other business factors I have considered in connection with my analysis include the following:

³⁸⁵ Expert Report of Dr. Leonard, February 8, 2016, Exhibit 1a.1, Note 4.

³⁸⁶ Alphabet Inc., 2015 Form 10-K.



7.2.4.1 Cost of Sales

296. The TAC Google incurred in connection with the AdSense and Display advertising programs is captured in the “Gross Profit from Android Ad Revenues” line item in the Figure above. The TAC Google incurs in connection with the AdWords (Search) advertising program is recorded by Google in App and Digital Content Cost of Sales, and is thus captured in the “Gross Profit of Other Android Revenue” line item of the above Figure.
297. The Cost of Sales of Apps, Digital Content and Hardware, including Infrastructure and Other Cost of Sales, is likewise captured in the “Gross Profit of Other Android Revenue” line item of the Figure above. Thus, I have considered and accounted for every Cost of Sale reported by Google as incurred in connection with the development and commercialization of the Android platform.

7.2.4.2 R&D Costs

298. As discussed above, I consider Google’s [REDACTED] R&D investment to be an investment which represents the value Google attributed to the Android platform.

7.2.4.3 Manufacturing Facilities and Other Tangible Assets

299. As discussed herein, as well as in my Initial Report, Google open sourced the Android source code which incentivized OEMs around the world to manufacture mobile devices that utilize the Android operating system. By doing so, Google accelerated its market entry while saving potentially billions of dollars of manufacturing-related expenditures.
300. The Infrastructure and Other Cost of Sales line item reflected in Revised Exhibit 7 is captured in the Figure above as part of “Gross Profit of Other Android Revenue.” According to Mr. Jonathan Gold, Infrastructure and Other Cost of Sales includes the cost of items used by Google in the manufacturing and shipping of Android-related products and services, including such things as Google laptop computers for employees associated with customer support and “payment processing.”³⁸⁷ Thus, I accounted for or otherwise considered all of Google’s capital expenditures relating to the development and commercialization of the Android platform.

7.2.4.4 Retail Sales Expenses

301. Google entered into agreements with wireless carriers such as T-Mobile, Vodafone, NTT DoCoMo and Verizon to provide incentives to adopt the Android operating system for devices compatible with their wireless networks.³⁸⁸ In so doing, Google established retail outlets for its Android devices, and avoided the high cost of buying or renting retail space around the Country and around the world, as well as the cost of employing and training retail sales representatives.

³⁸⁷ Deposition of Jonathan Gold, December 11, 2015, pp. 107 – 108, 126.

³⁸⁸ GOOGLE-12-00134317 (Google internal email forwarding 11/6/2007 WSJ discussing OHA announcement and Google deals with HTC, Samsung, Motorola, T-Mobile, Sprint, Nextel, NTT DoCoMo).



7.2.4.5 Sales and Marketing Expense

302. Revised Exhibit 7 reflects the Sales Expense of [REDACTED], and Marketing Expense of [REDACTED] that Google reported as relating to the commercialization of the Android platform. These expenses are captured in the Figure above.
303. A May 2015 Google presentation entitled “Introduction to Android,” indicates that Google expected to pay [REDACTED] in 2015 to its Android carrier Distribution Partners, OEMs, and Retail Partners through revenue-sharing agreements, channel incentives, and rent.³⁸⁹ According to Mr. Gold, to the extent Google actually incurred these costs in 2015, they are recorded as App Cost of Sales, Digital Content Cost of Sales, and likely Sales Expense and Marketing Expense.³⁹⁰ Because these costs are all captured in Revised Exhibit 7 as well as in the Figure above, I have accounted for and otherwise considered all costs associated with the sales and marketing of Android devices.

7.2.4.6 Legal Expenses

304. During the eight-year period 2008 to 2015, Google reported Android-related legal expenses not relating to this matter of [REDACTED]. These expenses are reflected in Revised Exhibit 7. Due to the unknown nature of these expenses, I do not attribute them to the Android platform in the Figure above. Thus, I have accounted for or otherwise considered this and every other Operating Expense Google reported as relating to the Android platform in its contemporary business records.

7.2.4.7 Conclusion Concerning Value of the Infringed Java Copyrights

305. I have considered all of the costs and expenses Google reported as having been incurred in connection with the research, development and commercialization of the Android platform. In the Figure below, these costs and expenses are deducted from the Ad Revenues apportioned to the Android platform, as well as revenues from sales of Applications, Digital Content, and Hardware. This results in \$8.8 billion of profit attributed to the Infringed Java Copyrights.

³⁸⁹ GOOG-00130338 – 386 at 340.

³⁹⁰ Exhibit 7 of my Initial Report.



Figure 13
Profits Apportioned to Infringed Java Copyrights

Apportionment of Android Related Profit	Amount (in millions)
Gross Profit of Android Ad Revenues	██████████
Platform Contribution Factor	██████████
Advertising Gross Profit Apportioned to Platform	██████████
Plus: Gross Profit of Other Android Revenue	██████████
Less: Android Sales and Marketing Expense	██████████
Profits Apportioned to Infringed Java Copyrights	\$8,829.4

8. STATUTORY DAMAGES

306. In my Initial Report, I calculated statutory damages relating to four copyrighted works. Based on the Court's Order Re Google's Motion To Strike dated February 5, 2016, I understand only the following two copyrighted works remain at issue in this case.
- Certificate of Registration, Java 2 Standard Edition 1.4, TX0006196514, Trial Ex. 464;
 - Certificate of Registration, Java 2 Standard Edition 5.0, TX0006066538, Trial Ex. 475;
307. Pursuant to the Copyright Act, Oracle is entitled to one award of statutory damages per work for Google's infringement, ranging from \$750-\$30,000 per work for non-willful infringement. For willful infringement, Oracle may be awarded up to \$150,000 per work.
308. I have been asked, based on my professional experience and in light of the available evidence, to calculate the appropriate statutory damages figure. I understand that Oracle may elect to receive statutory damages under the Copyright Act instead of actual damages and disgorgement of profits.
309. It remains my opinion that, based on my review of evidence, that due to the significant lost opportunity costs to Oracle arising from Google's infringement of the copyrighted Java works (as set forth herein) and the magnitude of the benefit obtained by Google as a result of their copying of the works (also as set forth in this report), the benefits to Google far exceed the available statutory range, and thus Oracle should be awarded the maximum amount available under the statute.
310. If Google's infringement is not found to be willful, Oracle should be awarded statutory damages of \$30,000 per work for a total of \$60,000.
311. If Google's infringement is found to be willful, Oracle should be awarded statutory damages in the amount of \$150,000 per work for a total of \$300,000.



9. **PREJUDGMENT INTEREST**

312. From an economic analysis standpoint, a time-value-of-money award would be necessary to compensate Oracle for the loss of use of funds during the damages period. However, I understand that an award of prejudgment interest is a legal matter and that the Court has substantial discretion in determining the interest rate and compounding method to be awarded. I have not prepared any prejudgment interest calculations as of this date, but am prepared to do so if requested by the Court.

10. **SIGNATURE**

313. I declare under penalty of perjury that the forgoing is a true and correct summary of my opinions in this matter,

A handwritten signature in cursive script, appearing to read "James".

James E. Malackowski

February 29, 2016

Date